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Behavioral Feeding Problems of Normally Developing Children Under 4 Years of Age

Julia Stanislavskaia
The University of Western Ontario

Supervisor
Dr. Alicia C. Garcia
The University of Western Ontario

Graduate Program in Foods and Nutrition
A thesis submitted in partial fulfillment of the requirements for the degree in Master of Science
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Behavioural Feeding Problems in Normally Developing Children Under Four
Years of Age

(Thesis format: Monograph)

by

Julia Stanislavskaia

Graduate Program in Foods and Nutrition

A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Science in Foods and Nutrition

School of Graduate and Postdoctoral Studies
The University of Western Ontario
London, Ontario, Canada

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Abstract

Objectives: The objectives were to identify common problematic behaviours in cases of normally-developing children under four years of age and determine whether there were associations between responsiveness to treatment and number of behaviours and visits to the clinic, as well as low body weight. **Rationale:** The motive for this study was to address the gaps in literature by characterizing the population, acquiring data to help establish consistent nomenclature and categorization as well as information to help design a screening tool in the future. **Methods:** Secondary data was collected retrospectively from 106 medical charts that fit the inclusion criteria. The data was analyzed to determine whether there is an association between responsiveness to treatment and the number of problematic behaviours, frequency of visits to the clinic, presence of a medical condition and weight, using descriptive statistics and two-tailed t-test for data analysis. **Results:** There were statistically significant differences between the responsive and non-responsive groups in the total number of problematic behaviours ($p < 0.0001$), specific problematic behaviours, total number of visits ($p < 0.0001$) and presence of concurrent medical condition ($p < 0.0001$). **Conclusion:** It may be useful to establish definitions for severe cases of feeding difficulties as the severe and non-severe groups differed significantly.

Keywords: behavioural feeding disorders, feeding disorders in infants and children, behavioural feeding problems, feeding problems in infants and children, feeding aversion, and sensory aversion

Acknowledgments

Foremost, I would like to extend my sincere gratitude and appreciation to the principal investigator, Dr. Alicia Garcia, who has provided me with immense support throughout this process. She has patiently guided me through this program by sharing her knowledge and support and has helped me get closer to my academic and career goals.

I would like to thank the co-investigator, Dr. Colleen O'Connor for very detailed and helpful feedback that has helped me ameliorate my proposal and research and ensure that no detail has been missed.

Furthermore, I would like to thank Dr. Berall, the collaborator, who has provided me with the fundamental education and experience leading to my desire and pursuit of research in the field of paediatric feeding disorders. Dr. Berall has served as the inspiration to move beyond my comfort zone and develop ideas and skills that contribute to the innovation and enhancement of our patient care practices.

I would also like to thank Katheryne Beaudry and Amy Bensimon, senior nutrition students from Ryerson University, who were quick and eager to train and learn the topic and assisted in the data collection for this study.

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Chapter 1

INTRODUCTION

This chapter provides background information on the prevalence and the potential impact of feeding disorders in children. It outlines the complex nature, causes, characteristics and types of feeding disturbances of early childhood along with the challenges of managing these. This information along with the objectives, hypothesis and rationale for this research help elucidate the significance and importance of the current study.

Background

According to Statistics Canada, children under 14 years of age make up 16% of Canada's population, while seniors make up 15 percent (Stats Canada, 2006). Although seniors and young children make up similar proportions of Canada's population, the health care resources allocated to pediatric-care are scant in comparison to the care of the baby boomer population that carries a significant financial burden (CIHI, 2013). This study focuses on children under 4 years of age, who comprise 5.5% of the population. This signifies that there are 1,921,412 young children residing in Canada at the present time (Stats Canada, 2013). Each year 376,294 children are born with the birth rate remaining stable between 2007 and 2011 (Stats Canada, 2013). There are numerous health concerns within this population that warrant more attention and research. Feeding problems is one of these concerns. It has been estimated that 25 to 45% of normally developing children experience feeding difficulties (FD), while 20 to 60% of parents report that their children are not eating well (Linscheid, 2006; Chatoor et al, 1994; Kerzner B, 2009). Amongst patients with developmental delay, up to 80% of children encounter feeding-related problems (Linscheid, 2006; Chatoor et al, 1994). This means that approximately 480,000 to 865,000 children in Canada may be struggling with feeding difficulties of varying severities and with variable potential health outcomes such as faltering growth, nutrient deficiencies, inappropriate development of motor skills and most notably long-term behavioural and emotional issues. Meanwhile, practitioners may not be aware of or equipped with knowledge and skills to deal with this health domain (Aldridge et al, 2010) as there is no universally accepted

definition or classification system and there are no treatment guidelines for this issue that is very multifactorial in nature and thus may require the involvement of a multidisciplinary team, which is not always accessible (Levine et al, 2011; Aldridge et al, 2010; Chatoor, 2003; Levy et al, 2009; Davies et al, 2006). Limited research, lack of consensus on terminology, optimal interventions and absence of clinical guidelines, even for the normally developing population, on a basic topic such as childhood feeding problems should prompt concern and further exploration (Levine et al, 2011; Chatoor, 2003; Davies et al, 2006).

Feeding is a basic, innate ability that is necessary to sustain life and support growth and development. Development of normal feeding depends upon the integration of specific physical functions, appropriate nutrition, adequate feeding and a synergistic relationship between the parent and the child (Satter, 1995; Gahagan S, 2012). Disruption in any of these areas can lead to feeding difficulties at early stages of life, which may be quite complex in nature, as well as significantly impact long-term negative effects on health (Chatoor et al, 2003; Marchi and Cohen, 1990; Kotler et al, 2011). The management of feeding difficulties in early childhood and their treatments are poorly understood and receive limited recognition, but are affecting a significant proportion of the young population (Davies et al, 2006; Benjamin et al, 2009). This is evidenced by lack of consensus on terminology, lack of clinical instruments, scant literature on treatment options and evaluations and finally the limited availability of interdisciplinary teams to address this issue (Linscheid, 2006; Greer et al, 2008).

Feeding difficulties may present as, but are not limited to: delay or absence of age-appropriate feeding skills, difficulty in tolerating solids or fluids, refusal to eat foods due to sensory aversion, lack of appetite and interest in food, sitophobia (fear of food or eating), weight loss, malnutrition and significant behavioural disturbances during and outside mealtimes (Aldridge et al, 2010; Davies et al, 2006; Bryant-Waugh et al, 2010; Chatoor et al, 2003.). When feeding problems at an early age are not addressed, failure to develop age-appropriate feeding skills, failure to thrive, nutrient deficiencies, delay in oral motor development, painful response to food, behavioural issues and impaired parent-child interactions along with other problems may result (Satter, 1995; Chatoor et al, 2003; Bryant-Waugh et al, 2010). Some of the most significant risk factors for development and maintenance of feeding issues include poor parental modelling, chaotic environments and family conflict (Chatoor et al, 1997; Cooper et al, 2004; Galloway et al, 2005.)

Potential long-term effects of unaddressed feeding problems in early life include later deceleration in weight gain and growth, anorexia nervosa, bulimia, obesity, anxiety disorders, aggressive behaviour, difficulty adjusting, attention problems and different degrees of malnutrition in childhood and adolescence (Chatoor et al, 2004; Dahl et al, 1994; Ammaniti et al, 2012; Kotler et. al, 2001; Marchi and Cohen, 1990).

There is a recently emerging interest and more research on this topic, which is evidenced by the limited number of articles available prior to the 1990s and a surge of research along with multiple attempts to create an acceptable diagnostic or classification system for feeding difficulties around the year 2000 and after (Chatoor, 2005; ICD-10, 2010; Berall, 2009; Sharpt et al, 2010; Emdet et al, 2005). Despite this interest, there is still limited knowledge and awareness of childhood feeding practices and especially feeding challenges within the health care system. For instance, many states in the United States of America may not be implementing standard infant feeding regulations in inpatient and outpatient-based practices (Benjamin et al, 2009). Some of the regulations for infant feeding in the United States include starting solids at an appropriate time, introducing cow's milk at the right time, feeding on demand during the appropriate time period and disruption of any of these standard practices may lead to FDs. An average of two out of 11 regulations are implemented in all the American states (Benjamin et al, 2009), which may be an indication of limited awareness, knowledge and education on this topic.

There are multiple reasons for this lack of clarity around management of FDs. Firstly there is no consistent agreement on what constitutes a feeding difficulty. This can be discerned by reviewing distinct definitions provided in the Diagnostic and Statistical Manual for Mental Health (DSM-IV) or International Classification of Diseases (ICD) and comparing those offered by researchers and clinicians specializing in the field and those actually utilized in paediatric clinics as well as by the plethora of definitions used in different research studies (Lucarelli et al, 2013; DSM IV-TR, 2000; ICD-10, 2010; Chatoor, 2003; Davies et al, 2006; Berall, 2009; Burklow et al, 1997; Kerwin, 2003). All these are described in further detail in Chapter 2. Furthermore, there is no evidence-based guidance to determine what constitutes a clinically significant feeding difficulty that may result in long-term health issues such as stunted growth, anxiety or eating disorders. Guidance to distinguish between potentially short-lived and clinically significant problems to determine the extent of medical concern and what intervention to provide is also necessary (Levy

et al, 2009; Levine et al, 2011). There is no widespread knowledge or acceptance of a classification system of different subtypes of feeding problems, such as sensory aversion or post-traumatic feeding disorder because in most inpatient or outpatient settings there are no information available on this for the patient or the health care provider, unless it is a specialized clinic. However, there is an increasingly greater number of practitioners who are publishing articles acknowledging and/or recommending the use of Chatoor's categorization system, which encompasses distinct types of FDs (Kerzner, 2009; Steinberg, 2007). Thus, there are no clear, consistent definitions used in the literature and consequently, there is limited recognition and diverse or inconsistent recommendations for treating these problems. Finally, there are no available screening or assessment tools tailored to this population to help practitioners identify types of feeding difficulties and insufficient research is available on different types of treatment modalities and outcomes in current practice. The screening tools available are either generalized and looking at the overall eating habits of the paediatric population encompassing all ages under 18 or there are very specialized screening tools like those for children with tube feeds or children with specific medical conditions such as cystic fibrosis (Odar et al, 2010; Lewinsohn et al, 2005; Crist et al, 2004; Archer et al, 1990). The general tools may be useful in research to look at incidence of feeding difficulties in a population for instance, but have limited application in clinical practice (Linscheid, 2006.) Treatment practices are poorly documented and are often limited to case studies (Sharp et al, 2010; Babbitt and Hoch, 1994).

Categorization and/or classification of feeding difficulties is particularly challenging due to the complex nature of this issue. There are many potential causes underlying FDs including organic, behavioural, neurological, nutritional and psychological, making it challenging to develop definitions, tools and treatment protocols (Burklow et al, 1997; Davies et al, 2006; Levy et al, 2009; Aldridge et al, 2010). However, a consistent component of treating FDs involves nutritional and behavioural strategies that concentrate on the meal and the mealtime environment, as well as child and caregiver behaviours that may present (Burklow et al, 1997; Owen et al, 2012; Martin et al, 2008). Children with FDs and their families often present with behavioural challenges as a primary or secondary concern (Burklow et al, 1997; Chatoor et al, 2002). Some of the studies looking at causes of pediatric feeding problems have found that a behavioural component is present in the majority of cases, no matter what other concurrent health problems are present (Burklow et al, 1997; Levy et al, 2009). Based on the available

literature, it can be said that nature of FDs is multifaceted and thus may be difficult to assess, but behavioural issues appear to be consistently present and thus should require as much attention as medical history when screening and assessing a child.

Given the heterogeneous nature of FDs, a diverse team of specialists may also be required to address them appropriately. As evidenced by recently emerging literature, a multidisciplinary approach involving several experts is considered the most efficient treatment of FDs as all components, including physiology, nutrition, behaviour, parent-child interactions and overall family function often have to be addressed (Martin et al, 2008; Owen et al, 2012; Greer et al, 2008; Cole and Lenham, 2011). A multidisciplinary approach involves input from more than one specialized health care practitioner. In the case of FDs, these may include a physician nutrition specialist, a psychologist, a psychiatrist, a registered dietitian, a nurse practitioner, a speech language pathologist, an occupational therapist, and/or others (Owen et al, 2012; Martin et al, 2008; Aldridge et al, 2010). It has been disputed as to which practitioner plays the central role in the care of children with FDs, and this is hard to determine as there are few healthcare facilities specializing in these services and those that do exist often have differences in structure and operative functions, such as types of specialists available, referral criteria and others (Owen et al, 2012). Furthermore, there is simply a lack of trained specialists and limited financial coverage by the national health plan (Ontario Ministry of Health and Long-Term Care, 2010). There is a substantial cost, which is typically over 100 dollars per session, for access to most trained specialists such as registered dietitians, occupational therapists (OT), psychologists or speech language pathologists that is not covered by the Ontario Health Insurance Plan (OHIP) (Ontario Ministry of Health and Long-Term Care, 2010; CAOTBC, 2013). This cost may be covered by some of the insurance plans, but not always and not every family has one. Based on the author's (JS) current practice, it can also be noted that locally, few of these professionals actually specialize in feeding. For instance, when referring to an OT in Toronto, there is only one individual specializing in feeding difficulties in children and consequently she has a very long waiting list.

Despite the numerous gaps in the literature, the limited number of specialists addressing FDs and the differences in practice, a common set of FD categories has been proposed by different expert groups (Chatoor, 2005; ICD-10, 2010; Berall, 2009; Sharp et al, 2010; Emden et al, 2005; Davies

et al, 2006). Based on some of the recent literature (Bryant-Waugh et al, 2010; Berall, 2009; Kerzner, 2009) and current clinical practice where this study took place, the following types of FD categories are used in this report: i) children with poor appetite due to organic causes, ii) children who are poor eaters as per parental misperception, iii) children with no interest in food and limited intake who are otherwise vigorous, iv) children with poor appetite who are also apathetic or withdrawn, v) children with limited intake and/or poor appetite due to sensory aversions, and vi) children who fear feeding due to a past traumatic event.

Definitions

When an infant presents with poor appetite and/or weight loss, an organic cause has to be ruled out first. Infants with poor intake due to a medical condition may exhibit symptoms such as dysphagia, diarrhea, vomiting, recurrent chest symptoms, allergic reactions and other numerous symptoms (Kerzner, 2009; Levy et al, 2009; Kerwin, 2003; Manikam and Perman, 2000). When a medical condition is present, other feeding issues may develop as a byproduct or may be co-existing. For example, fear of feeding may develop after severe, untreated gastro-esophageal reflux disease. This in turn can provoke other behavioural issues as parents may proceed to cater excessively to child's preferences or force-feed in order to prompt weight gain (Manikam and Perman, 2000; Kerzner, 2009; Satter, 1995; Burklow et al, 1998). In this study, feeding issues, in which only organic cause is the focus of treatment and no other types of FDs are present, are not addressed. For example, when a child has difficulty with feeding due to vomiting (secondary to gastroesophageal reflux disease), but the vomiting resolves once medication is started and there are no other feeding issues, it is not an appropriate case for this study as it looks at the medical condition only. However, FDs that are organic in nature with behavioural issues coexisting or developing in the process are explored.

Families often present with a child that is not eating well, not gaining enough weight or exhibits faltering growth, which refers to a growth rate below expected for the child's age and sex and encompasses weight, length/height and head circumference (Shields et al, 2012.). Sometimes this occurs only due to parental misperception as they may have a personal set of expectations that are not realistic or based on clinical facts. On other occasions, difficulties may be arising due to inappropriate diet and/or feeding environment (Parkinson et al, 2004; Berall, 2009). In some of these cases, the children may be thriving and eating a well-balanced diet, in others dietary quality

may be poor, but the weight gain may be appropriate. In most patients with moderate to severe complexity of FDs, lack of weight gain, weight loss, malnutrition and high levels of distress among the family members may be observed (Chatoor et al, 2003; Berall, 2009). Parents need to be educated on the expectations around development of feeding skills, normal dietary intake and growth pattern. Most importantly, families need to be educated, trained and supported through learning what constitutes an appropriate, balanced diet and a healthy meal environment (Manikam and Perman, 2000).

Another category of FDs includes vigorous, healthy children who display minimal interest in food and are easily engaged in anything but eating and rarely express hunger signals. This is also deemed by some experts as infantile anorexia and often becomes evident between 6 months and three years of age, as the transition from spoon to self-feeding occurs (Bryant-Waugh et al, 2010; Chatoor et al, 2003; Berall, 2009; Chatoor et al, 2004). Again, parental behavioural, meal setting and dietary quality are the points of focus when managing this subset of children (Berall, 2009.)

Children who have poor appetite and also present as apathetic, withdrawn and appear depressed, may be subject of parental neglect (Berall, 2009). In part based on personal experience, it can be said that this type of FD is seen in practice less frequently, but may warrant a hospital admission and/or involvement of a specialized health team, including child services, psychiatry and others, more often (Chatoor et al, 2003, Berall, 2009). Although this category is included, it is minimally addressed due to low incidence rates

Children with sensory aversion present as very selective eaters with a hypersensitive nervous system (Chatoor, 2003). They may exhibit tactile, taste, smell, auditory and/or visual hypersensitivities with varying degrees of anxiety when exposed to unfamiliar foods or other stimuli (Chatoor, 2009; Chatoor, 2003; Berall, 2009). Highly selective eaters often present with both behavioural and sensory issues and one has to determine what predominates, as in some cases addressing the behavioural component alone may help manage sensory aversion.

Finally, children with post-traumatic feeding disorders, although there is a low incidence of, may require a specific approach. Children with fear of feeding will often present as crying at the sight of solid foods or a bottle (Chatoor, 2009). A traumatic feeding experience, such as choking or

force-feeding, is likely preceding an onset of this FD (Chatoor, 2003; Chatoor et al, 2001; Berall, 2009).

When managing any of the above types of feeding difficulties, behavioural and dietary strategies are usually the central component of clinical intervention (Crist and Napier-Phillips, 2001; Burklow et al, 1997). Therefore, all these categories will be grouped under the umbrella term of behavioural feeding problems (BFPs).

Objectives

The current study aimed to gather data on a group of children, under four years of age, with BFPs referred to a specialized clinic where feeding issues are commonly addressed. The data collected included population characteristics and some demographic information, clinical interventions and subsequent outcomes. Based on these, the secondary objective was to create and test a tool that will help identify the type and severity of the FD and determine the optimal treatment approach at earlier stages of care.

More specifically, the first objective was to collect secondary data, which initially has been collected during patient appointments as part of the regular assessment. The goal was to use the collected data to determine whether there is an association between the type and the number of problematic feeding behaviours, displayed by either the child or the parent, the number of interventions needed for treatment and the severity of the case. Associations between behavioural characteristics and ideal body weight as well as other health complications were also analyzed. Based on this data, a tool in the form of a ranking scale was designed. The purpose of the tool is to aid in determining the type, severity level and optimal treatment pathway for a patient with a FD. The final objective of the study was to collect primary data using this ranking scale to validate it as an effective tool to plan feeding interventions.

Hypotheses

The null hypothesis of the study was that the number and the types of feeding behaviours present in a child or parent are not associated with an increased number of required interventions, lower body weight and increased severity of the case. Furthermore, it was hypothesized that the ranking tool developed from the secondary data collection will predict the type of the feeding behavioural problem and its responsiveness to intervention.

Rationale

The motive for this research was the need to clarify and establish the existing types of feeding difficulties in infants and toddlers and bring to light the complexity and diversity of this health issue. It is necessary to understand how the medical community manages this patient population, especially when looking at a setting that caters specifically to it, and how one can manage the feeding problems more effectively. The need for consistent and well-defined categories along with screening and assessment tools for this common paediatric issue prompted this exploration. The development and use of such a tool is essential to defining common types of feeding difficulties and understanding what types of symptoms and behavioural manifestations are common which may lead to more complex medical, psychosocial or other health problems. Optimal interventions to implement and the intensity/frequency of required interventions may also be defined. Overall, the goals of this tool are to quickly identify and treat complex, severe feeding difficulties while avoiding complications and to determine and provide more efficient and fluid care to patients who have less complex problems.

With a better understanding of this clinical population and utilization of such a tool, one can anticipate a number of health benefits. Some of these benefits may include but are not limited to appropriate weight gain, appropriate growth and development, appropriate development of feeding skills, prevention or rectification of nutrition deficiencies such as iron deficiency anemia, and the development of a healthy relationship with food and a healthy psychosocial dynamic between parent and child.

Lastly, with few specialists trained in addressing FDs and limited evidence and understanding as to which specialists are typically central in this care, the role of a registered dietitian may also be highlighted as the main component to managing feeding difficulties of early childhood.

Chapter 2

LITERATURE REVIEW

The literature search was conducted manually using search terms including, but not limited to: behavioural feeding disorders, feeding disorders in infants, feeding disorders in children, behavioural feeding problems, feeding problems in infants, feeding aversion and sensory aversion. Secondary topics such as the role of maternal and parental anxiety, behavioural interventions, and the importance of the multidisciplinary team in addressing infant feeding disorders were also searched. Searches were conducted using several databases and online clinical journals available at the University of Western Ontario Library system. The databases included: PubMed, Proquest, Wiley, Ovid, EMBASE, Web of Science and Scopus. Some of the main journals used for the search were Paediatrics, American Journal of Clinical Nutrition, Journal of the American Medical Association, Lancet, Journal of Paediatric Psychology, Nutrition in Clinical Practice and Journal of Eating Disorders. Journal articles from the year 1990 to 2014 were included. Approximately 70 relevant articles were found, but only the most pertinent ones were used. Some of the articles were editorials, opinion papers and case studies rather than clinical trials; they were not utilized in the literature review, but kept on file for additional supporting evidence. All of the most relevant literature was divided into different subtopics to review all the main aspects and demonstrate what has been done in the field of paediatric feeding problems to date.

Impact of feeding difficulties on nutritional status, growth and health in later life

Despite the significant prevalence, 25-45%, of feeding problems in early childhood, limited research has been conducted to examine how this issue may affect children at later stages of life (Linscheid, 2006). Of particular concern may be the impact of feeding difficulties (FDs) on growth, nutritional status and development of feeding skills, cognition, social and emotional health, among other potential health problems.

One study examined if parent-reported feeding problems actually correlate with lower caloric intake and smaller weight gain (Lindberg et al, 2006). Four day food records and anthropometric

measures at two points in time were used to analyze the dietary intake and growth of 15 children and a similar group of control subjects with no feeding issues. Food records collected at first point in time demonstrated that the experimental group had more children consuming less than 50% of caloric requirements. At the second time interval, all children with reported FDs consumed less than 50% of their caloric needs, whereas only three children from the control group consumed less than 50% of recommended energy intake. Children in the control group also had higher weights over time. This is one of the few studies showing that parent-identified feeding problems in early childhood are associated with a lower nutritional intake and lower weight and length/height when compared to healthy controls.

A Swedish study looked at persistence of early problematic eating behaviours into primary school years in children presenting with refusal to eat in infancy without a medical explanation (Dahl et al, 1994). The research looked at 18 children with refusal to eat in infancy and how they later compared to 240 control subjects in primary school. The results showed that early food refusal, without underlying medical conditions, was predictive of problematic feeding behaviours, such as eating small amounts, refusing many foods and poor behaviour at meal times, persisting into childhood. Significant differences between the two groups in weight and height attained were observed only at one year of age. By the second point in time, in primary school, the growth has increased and there were no significant differences in measurements between the two groups.

An earlier study looked at the relationship between early childhood feeding behaviours and development of eating disorders (EDs) in later life (Marchi and Cohen, 1990). Parents and their children were interviewed on specific, problematic feeding behaviours at three different points in time over a span of 10 years. The results showed that problematic eating behaviours were stable and tended to persist from early childhood into adolescence. Furthermore, specific behaviours were associated with eating disorders later in life. For example, selective eating was predictive of anorexia nervosa (AN), while pica and challenging meal times were predictive of significant symptoms for bulimia nervosa (BN) (Marchi and Cohen, 1990). According to this research, when problematic feeding behaviours are left untreated, they may persist into adulthood potentially affecting emotional health and may increase risk of an eating disorder.

Another study also investigated the longitudinal relationship between early-life eating behaviours and development of eating disorders: from childhood, through adolescence, early adulthood and adulthood (Kotler et al, 2001). Eight hundred children and mother pairs were interviewed at three points in time, starting from early childhood, on the presence of specific feeding behaviours. These behaviours included picky eating, unpleasant meal times, physical struggles such as pushing spoon away or degree of force-feeding by the parent during eating, food quantity consumed, meal duration and interest in food. The results showed an association between lack of interest in food, limited intake and the development of BN. Struggles with meals were associated with both AN and BN in adulthood. These results are similar to the finding of Marchi and Cohen (1990), indicating that behavioural challenges during meals times and limited intake due to selectiveness and/or lack of interest in food in early childhood may be associated with development of eating disorders in later life. Neither of these studies addressed the category of Eating Disorders Not Otherwise Specified (EDNOS). Further research is necessary to determine whether there is a relationship between behavioural feeding problems and eating disorders as well as obtain new information or replicate previous findings on specific behaviours that may be risk factors for development of EDs.

A more recent investigation looked at children diagnosed with infantile anorexia and whether their nutrition status and eating behaviours change overtime (Ammaniti et al, 2012). More specifically, the study looked at how malnutrition and behavioural feeding difficulties differ at two, five and seven years of age. The investigators examined the psychological characteristics of the mothers and the potential correlations between mothers' behavioural profiles and children's emotional and feeding development. The sample consisted of 70 children diagnosed with feeding disorders as per Diagnostic and Statistical Manual of Mental Disorders DSM criteria and 72 control subjects. The results showed that although initially 51% of children with Infantile Anorexia (IA) showed chronic malnutrition, by the third time interval 87% of children had none or mild malnutrition and showed no evidence of malnutrition in later follow up sessions with their paediatricians. Problematic behaviours appeared to decrease over time with the exception of "food fussiness", which appeared to increase in children with IA at second and third visits. When examining the emotional functioning of children with IA, the analysis revealed overall higher scores for emotional reactivity, somatic complaints, aggressive behaviour, withdrawal and attention problems when compared to the control group. Children with IA also had significantly

higher scores for attention problems and aggressive behaviours. This research is further proof of the significance of the behavioural component in management of FDs, as there is mounting evidence demonstrating a connection between problematic feeding behaviours and emotional health in later life.

Chatoor et al. (2004) looked at the impact of failure to thrive (FTT) on cognitive development in thirty infants with infantile anorexia (IA) compared to picky eaters with normal growth patterns and healthy controls. All three groups fell within healthy range of cognitive functions, but the picky eaters and IA group had significantly lower scores on the mental development index (MDI) and did not differ from each other. Both the picky eaters group and the IA group exhibited lower percentages of ideal body weight, with the IA group being the lowest. However, there was no statistically significant correlation between % ideal body weight and MDI score. Children with IA also displayed higher levels of problematic behaviours, including feeding and playing conflict, struggle for control during feeding and less reciprocity. Socioeconomic status (SES) and maternal education were inversely related to MDI score. Difficult interactions, such as feeding conflict and struggle for control were negatively associated with MDI score. This led the authors to conclude that psychosocial factors like infant-mother interactions, SES and maternal education were associated with lower cognitive development scores as opposed to faltering growth alone (Chatoor et al, 2004). This study elucidates some important concepts, such as that lower weight and/or poor nutrition status are not the only significant factors in a child's mental development. Importance of behavioural patterns and the quality of child-parent interactions must be acknowledged and incorporated into assessment of FDs to prevent future cognitive, behavioural and psychological problems.

It is challenging to deduce concrete conclusions from these studies as there is great heterogeneity in the definitions of FDs used, sample sizes and outcome measures. While some of them focus on specific feeding behaviors (Dahl et al, 1994) which also vary, others look solely at IA or FTT (Chatoor et al, 2004; Ammaniti et al, 2012). However, in order to have a complete and clear understanding of the repercussions of FDs, all types of behavioural feeding problems and all the associated behaviours should be investigated. So far the studies seem to indicate that although growth and nutritional status may correct or improve into later childhood and adolescence, it is the emotional and behavioural issues that persist into the future. There appears to be a potential

association between FDs and eating disorders, but this has to be investigated further. Potentially, one of the most important tasks in studying this topic could be identification and labelling of the predominant, recurrent parental and child behaviours, such as force-feeding by parent or rejecting milk by child, as they may be predictive of the subtype of FD and the overall difficulty level of a patient case, understanding which may help clinician assess, educate and treat more effectively.

All these studies used varying definitions and looked at non-organic FDs only, but in practice FDs frequently develop secondary to a medical condition or they may co-exist together (Levy et al, 2009; Levine et al, 2011, Burklow et al, 1998).

Terminology in the Literature

The study of feeding difficulties of early childhood is a relatively new field and thus presents with a number of challenges: 1) there is no consistent nomenclature of feeding difficulties (FD) subtypes, although categorizations have been proposed; 2) the definitions used in research literature are inconsistent; 3) consequently, there are no clear, agreed upon practice guidelines and there is lack of general knowledge and understanding of how to identify and treat feeding difficulties; 4) there are no validated tools available to help practitioners identify and/or categorize type/s of FDs; and 5) overall, limited literature is available on different types of feeding difficulties, treatments and outcomes.

Since there is no consistent definition and understanding of FD within the health care system, a number of terms are generally used in research and they have been varying through decades. These terms are typically ambiguous and based on loose criteria or they refer to very specific FD subtypes.

One common term used in the literature is failure to thrive (FTT), which refers to inadequate growth or decelerated growth velocity in early childhood (Cole and Lenham, 2011). There is no consensus amongst practitioners and health organizations on the anthropometric data that should be used to support this definition, but in practice it usually refers to weight for age that falls below the 5th percentile or drop off the usual weight curve by two major percentile lines on the growth chart (Cole and Lanham, 2011). Using this as single criteria has shown to have a low predictive value for undernutrition or degree of feeding difficulty. Most importantly, FTT is a

symptom of a feeding disorder, not a diagnosis (Shields, 2012). One study examined the sensitivity and predictive value of seven different anthropometric criteria, such as Waterlow criteria and low body mass index (BMI) for FTT by applying them to a birth cohort of approximately 6000 children (Olsen et al, 2007). As a result each single criteria identified less than half of the children who were significantly malnourished and most children were identified by one criteria only, showing very poor concurrence (Olsen et al, 2007). This shows the limitations of FTT as well as the existing anthropometric criteria in identifying children with malnutrition.

Often FDs are defined by the standards of Diagnostic and Statistical Manual for Mental Disorders (DSM-IV-TR). This manual has a category of “feeding disorder of early childhood”, which is defined as failure to obtain adequate nutrition for at least one month along with weight loss or failure to gain weight and in the absence of a medical condition or a mental disorder, before six years of age. This definition does not provide details on what constitutes an inappropriate weight or weight gain. Moreover, there are no specifications about the potential causes of the feeding disturbances, yet the criteria are restrictive and may be excluding many patients with clinically significant feeding difficulties. The criteria are also limiting because children can maintain weight while consuming a nutritionally inadequate diet or lacking age-appropriate feeding skills as parents may be force-feeding or providing excessive amounts of formula and milk to compensate (Levy et al, 2009; O’Connor and Szekely, 2001). Finally, they may exhibit faltering growth over time rather than just weight loss or slow gain (Marchand, 2012). It is not clear what other evidence, aside from low weight, is needed to define a feeding disorder. It is also possible that low weight may not be a key component in feeding disorders, but rather a secondary criterion. To illuminate the limitations of these definitions, one study looked at 234 children referred to a feeding clinic and found that only 19 of them or 8% met the criteria for DSM-IV-TR definition (Williams et al, 2009).

The International Classification of Diseases, ICD-10, used by the World Health Organization (WHO) has a category for Feeding Disorder of Infancy and Childhood, which is defined as food refusal and extreme selectivity in the presence of adequate food supply, absence of organic disease and under the care of a competent caregiver (ICD-10, 2010). Again, several issues arise as there is no definition for a “competent parent”, children from low income families or an

inappropriate environment are excluded and the possibility of overlap with organic disease is eliminated.

Another common definition used in research is infantile anorexia (IA). It refers to children who refuse to consume adequate amounts of food for over one month (Chatoor et al, 2004, Ammaniti et al, 2012). They are alert, vigorous and display healthy interactions, but show limited interest in food and do not exhibit or communicate hunger signals (Chatoor et al, 2004). IA commonly occurs within the first three years of life, typically during the transition from spoon-feeding to self-feeding and is believed to often be outgrown by three years of age.

Other literature refers to more specific subtypes of feeding disorders that have been emerging in the past ten years as researchers are attempting to identify common terminology and categories for FDs. Some of these FDs include sensory food aversion (SFA), post-traumatic FD, food neophobia, pica and rumination disorders (Chatoor et al, 2004; Lucarelli et al, 2013, Bryant-Waugh et al, 2010, Chatoor and Ganiban, 2003; ICD-10, 2010).

Lastly, other studies examined FDs by looking for a set of behaviours, such as food refusal, selective or fussy eating, pocketing foods, eating very slowly, and others via direct observation or as reported by parents (Sanders et al, 1993). While identifying specific behaviours may be essential to understanding and categorizing the type of feeding difficulty and its severity, it does not provide a definition. It may be helpful to have one standard, well-defined term that encompasses all types of feeding difficulties. All the subcategories of FDs should also be defined separately and consistently while grouped under one general term. Simplifying and using one consistent term for FDs as well as consistent definitions for the subcategories may facilitate the research process, provide a better understanding on this issue for care providers and prompt more effective discussion and education amongst clinicians and patients.

Characterizing behaviours

A number of studies attempted to characterize the typical behaviours present in children with FD and their parents. A group of researchers compared the feeding behaviours of parents and children, aged nine months to seven years, between three groups: normative/healthy group, clinical group with medical issue and a clinical, non-medical group (Crist and Napier-Phillips, 2001). Behaviours were examined using the Behavioural Paediatrics Feeding Assessment Scale

(BPFAS). Some of the main parental behaviours they examined included coaxing, catering by preparing multiple meals, force-feeding and using threats. Children's behaviours that were analyzed included self-feeding, duration of eating, tantrums, getting up from the table during the meal and others. The researchers found that the clinical group of children without medical problems had higher scores and thus more feeding difficulties than the children with a medical issue present. Both clinical groups exhibited more problematic behaviours when compared to the control group (Crist and Napier-Phillips, 2001). Furthermore, there was a significant correlation between high scores on poor parental strategies and dietary restrictiveness. These results provide baseline evidence that children with FDs, with or without medical conditions, demonstrate more problematic behaviours when compared to the control group. It is important to note, that the FD group with medical issues displayed less problematic behaviour than the group with FD alone. It will be useful to compare the outcomes of this investigation to see whether results are replicated (although different tools and parameters are used to collect information.)

There is more research looking at prevalence of specific behaviours, especially high risk behaviours such as force-feeding. One study has examined the actual prevalence of coercive feeding practices among children with FD and how parental behaviours differentiate when compared to healthy controls and their parents (Sanders et al, 1993). The investigators coded all the behaviours and came up with 17 general categories including non-compliance, non-interaction and oppositional behavior. The results showed that children with FD demonstrated significantly more food refusal, noncompliance, oppositional behaviour as well as a significantly lower rate of chewing. Parents of children with FD engaged in more frequent negative behaviours such as frequent contact, negative instructions and comments, negative prompting and negative social attention. Associations were also found between specific parental and child behaviours. For instance, a child's excessive playing with foods was associated with negative parent behaviours. Examples include negative physical contact such as restraining arms or forcefully placing spoon in mouth and negative instructions such as aversive verbal commands to continue eating when child wants to stop (Sanders et al, 1993). Another study used direct mealtime observation to determine the behavioural characteristics of children with FTT compared to the controls (Chatoor et al, 1997). The authors found no significant differences in mealtime behaviour between the cases and controls. However, many typical behavioural characteristics were not accounted for, such as parental anxiety and feeding techniques, feeding

schedules, mealtime distractions and others. In addition, children not meeting the criteria for FTT and/or of adequate weight may have feeding difficulties, rendering this comparison flawed (Parkinson et al, 2004).

Levy et al (2009) conducted a cohort study looking at behavioural patterns of patients with FTT that would help distinguish between organic and behavioural causes of FD. The researchers found that typical behavioural issues such as food aversion, fixation and anticipatory gagging appeared more frequently in the behavioural than the organic group. Surprisingly, the quantity of food ingested and vomiting frequency did not differ significantly between the two groups. Poor weight gain was significantly more frequent in those with organic disorders, but more than 50% of the behavioural group also met the criteria for FTT. The researchers recommended for practitioners to incorporate relevant behavioural questions to help distinguish between organic and non-organic causes. The challenge remains that feeding difficulty is a multi-factorial issue and behavioural feeding problems are often present in those with organic disease and may develop pre- or post- medical condition.

A group of researchers created an instrument that measures problematic feeding behaviours of 36-month old children as perceived by mothers in a community setting (Lewinsohn et al, 2005). The two most common behaviours reported by mothers included spitting out of foods and inappropriate behaviour when food was restricted. Some other commonly reported behaviours were tantrums, choking, turning head away and pushing or throwing away food. Although it is helpful to look at community samples, the clinical significance may be limited as many of these behaviours may not be of clinical value unless occurring at a certain frequency and intensity. Some behaviours, like turning head away, is anticipated as it is a way to signal that one is full and is too vague. Thus, the characteristics described could be simply a less joyous part of feeding that most young children exhibit at some point in time. This paper does provide insight into parents' perception of feeding, which is important in understanding parents' perceived challenges and in developing educational programs and materials for families.

Parental Behaviours

It is crucial to understand that, while much of the focus of FDs has been the child, it is the parent-child interaction that is often challenged and needs to be addressed rather than the child's

behavior alone (Davies et al, 2006; Bryant-Waugh et al, 2010). Parental feeding style and temperament and/or the child's temperament may not always be an idyllic match. In these cases, parents will require guidance on how to work through the feeding relationship. Education and instructions are provided, either at the end of each appointment or towards the end of a hospital admission, after the parents had sufficient opportunity to observe the feeding process (Manikam and Perman, 2000). The parents should be educated on how to modify their feeding style, provide a healthy meal environment, understand their child's temperament and potentially work on their emotional disposition (especially during meal time) in order to succeed (Manikam and Perman, 2000; Babbitt and Hoch, 1994) . Therefore, studying parental behaviours in FDs is of equal importance and they have been investigated in most of the studies mentioned above (Chatoor, 2004; Levy et al, 2009; Lewinsohn et al, 2005; Sanders et al, 1993).

Some parents simply may be providing an imbalanced diet, for example, inadequate caloric intake due to missing macronutrients, offering excessive milk or formula amounts or giving inappropriate textures for the child's age (Byard et al, 1996). The feeding environment may also be inappropriate for multiple reasons, such as use of distractions, feeding child in isolation or allowing child to leave and come back to the table as they please (Davies et al, 2006). Parents who are too rigid may not be responsive to their children's feeding cues nor allow them to advance with feeding skills at an appropriate pace (Davies et al, 2006). Parents who are more chaotic may fail to provide the structured environment that is vital for a child's feeding development (Davies, 2006). For instance, if a parent provides continuous snacks and allows the child to graze, rather than using a regular schedule for meals, the child will not have an opportunity to feel the hunger cues. When there is subsequently no appetite, the child may exhibit picky behaviour at meal time while filling up on crackers through the day or in cases of IA may just eat fewer calories overall as these children have a lower interest in food (Berall, 2009; Bryant-Waugh, 2010).

One study looked at the specific maternal behaviour of frequent breastfeeding and its association with FTT by reviewing case studies of infants 8-11 months old receiving most of their calories from breast milk (O'Connor and Szekely, 2001). The authors concluded that the focus of the treatment should be the mothers' psychosocial issues as in most cases the mothers were using breastfeeding for personal and infants' comfort as opposed to nutrition. There are no controlled,

randomized trials looking at the impact of excessive milk or breast milk consumption on infants and toddlers with low or normal weights although this is regularly seen in practice. One cross-sectional study did demonstrate excessive milk drinking as a problematic feeding behaviour frequently cited by parents. It showed that excessive milk drinking was correlated with poor appetite, but not FTT (Wright et al, 2007).

Chatoor et al (2004) looked at associations between IA and maternal characteristics as well as mothers' perceptions of the child's temperament. The authors found that signs of insecure attachment were more prevalent amongst mothers of children with IA. However, there were no correlations between marital problems and mothers' unhealthy eating attitude and presence of IA (Chatoor et al, 2000).

While more and more researchers are looking at parental behaviours and characteristics when studying FDs, it is still not known what parental behaviours predominate in the context of FDs and which behaviours and characteristics yield more challenges in managing FDs. Impact of parental anxiety is an important factor that should be looked at independently as well.

Organic versus behavioural cases

One of the first steps to classifying feeding difficulties is distinguishing between organic and non-organic cases (Kerzner, 2009; Levy et al, 2009). A number of studies have addressed the challenge of distinguishing organic versus non-organic feeding issues. One interdisciplinary feeding team retrospectively reviewed reports of 103 children presenting with FD in order to determine the existing categories of FDs (Burklow et al, 1998.) The results showed that the minority of cases, approximately 15%, can be classified only under one category. Moreover, the largest group with only one identified category consisted of children presenting solely with behavioural issues. Overall, 80% of children had a significant behavioural component as part of the FD, despite other organic causes such as structural, neurological or metabolic. This research supports the complexity of feeding difficulties and illustrates the centrality of behavioural feeding issues in children with or without other medical conditions (Burklow et al, 1998).

Another multidisciplinary team identified some of the maternal and infant behaviours that would diagnose infant feeding disorders requiring behavioural intervention, in the absence of or with co-existing medical conditions (Levy et al, 2009). The group looked at two outpatient cohorts.

One cohort consisted of 68 children that responded to medical therapy not requiring behavioural intervention, while the other group of 83 children presented with food refusal responsive to behavioural therapy only, not medical, surgical or nutritional interventions. The behavioural group exhibited significantly higher frequencies of food aversion, food selectiveness, head turning, gagging, food pocketing, emesis, absence of hunger signals and an overall lower intake and poor weight gain when compared to the medical group that required no behavioural interventions. Parental behaviour also differed between the two groups as parents in the behavioural group displayed significantly more frequent force feeding, nocturnal feeding, conditional distractions, prolonging meal times and disregard for the child's hunger cues. Furthermore, researchers found that emesis was present in both groups and referrals for poor weight gain, FTT and vomiting did not help distinguish between children with organic and non-organic feeding disorders. Many children with behavioural feeding difficulties also did not necessarily meet the criteria for FTT, as they likely met weight criteria due to the maladaptive feeding strategies adopted by parents. The general characteristics of FDs were the presence of a disruptive infant feeding behaviour, abnormal parental feeding practices and an initial trigger, such as transition to self-feeding, traumatic event or a medical condition. The authors identified and compiled lists of specific parental and child behaviours that may be very helpful in understanding and treating feeding disorders of infancy.

These two studies are of great value as they demonstrate the prevalence and centrality of behavioural difficulties in infant feeding disorders no matter the context. This is a strong indication that behavioural components should always be evaluated and clinicians should be prepared to provide the corresponding interventions. Table 1 outlines the different parental and child behaviours investigated in the studies cited earlier. This table helps to illustrate the differences and similarities in the behaviours of concern investigated.

Proposed categorization scales

In the midst of confusion around classifying feeding disorders, while encompassing all the influencing factors, multiple authors and organizations tried to identify and categorize different FDs (ICD-10, 2009; Emder et al, 2005; Chatoor, 2002; Berall, 2009). The goal of the classification system would be to identify the subtype(s) of FDs present in a patient, the clinical severity of the case, which aspect of FD to prioritize first and what specialist referrals may be

warranted. Furthermore, a classification system is necessary for further exploration of treatment options for each type of FD and the creation of screening and assessment tools.

Chatoor (2002) has been one of the most forthcoming researchers in this field and her team has proposed a classification system along with the diagnostic criteria that has been adopted by several other groups. Based on the different types of FDs reported and documented by other practitioners, Chatoor (2002) has described and categorized different types of feeding problems.

The subtypes proposed include feeding disorder of state regulation, feeding disorder of reciprocity (neglect), infantile anorexia, sensory food aversions, posttraumatic feeding disorder and FDs associated with a medical condition (Chatoor, 2002). Overall, much of Chatoor's research concentrates on posttraumatic FD, sensory aversion and IA (also labeled as unpredictable food refusal) (Chatoor and Ganiban, 2003). The detailed diagnostic criteria and proposed treatment modalities for these categories can be found in several papers (Chatoor, 2002; Chatoor and Ganiban, 2003; Davies et al, 2006).

The subtypes proposed in the present study (poor appetite due to parental misperception, poor appetite in apathetic child, poor appetite in vigorous child, sensory aversion and post-traumatic feeding disorder) are a more accurate representation of FDs as they are seen and understood in current practice when compared to diagnostic criteria put forward by DSM IV-TR, ICD and others (ICD-10, 2010; Emden et al, 2005; Chatoor, 2002; Berall, 2009; DSM IV TR, 2000).

In 2005, The National Centre for Infants, Toddlers and Families, known as Zero to Three has adopted Chatoor's diagnostic classification with slight modifications. Two subtypes were renamed and minor changes to the diagnostic criteria were made (Emden et al, 2005).

Table 1: Behavioural patterns in paediatric feeding difficulties

Study	Population age	Child Behaviours	Parent Behaviours
Levy et al, 2009 n = 151	<24 months	<ul style="list-style-type: none"> -food refusal (bottle/spoon/solids) -head turning, fixation -anticipatory gagging -meal related gagging -oral retention of food -lack of hunger cues -low intake, poor weight gain -vomiting 	<ul style="list-style-type: none"> -nocturnal feeding -force feeding -persecutory feeding -conditional distraction -mechanistic feeding -prolonged meals
Parkinson et al, 2004 (n = 87)	13 to 21 months	<ul style="list-style-type: none"> -accept, refuse, feed self -reject (spits out food/drink after accept or feed self) 	<ul style="list-style-type: none"> -give food/spoon/bottle/cup
Crist & Napier-Phillips, 2001 (n = 345)	9 months to 7 years	<p>Most common behaviours from BPFAS (Behavioural Paediatric Feeding Assessment Scale):</p> <ul style="list-style-type: none"> -gets up from table during meal -eats junk and will not eat at meal time -refuses to eat meal and request food immediately after -white or cries at feeding time -will not come readily to meal time -would rather drink than eat -tantrums at meal time -will not eat vegetables -will not try new foods -delays eating by talking 	<ul style="list-style-type: none"> -coaxing -using threats -making multiple meals -force feeding
Sanders et al, 1993 (n = 45)	12 months to 6 years	<ul style="list-style-type: none"> -requests food -bites, chews -refuses food, compliant -physical negative -appropriate verbal -engaged activity -holds food, leaves table -plays with food -oppositional; non-interactive -vomit 	<ul style="list-style-type: none"> -praise -positive/negative contact -positive/negative prompt -positive/negative specific/vague instruction -positive/negative eating comment -positive/negative social attention -presents/removes food

Lastly, another group of physicians specializing in FDs, many of them referenced above, gathered in 2009 to discuss the latest categorization scale proposed. Again, similar categories emerged, including: 1) infants with poor appetite due to organic causes, 2) those with poor appetite due to parental misperception, 3) those with poor appetite who are otherwise vigorous, 4) poor appetite in an apathetic child, 5) children who display selective behaviours, 6) infants with colic, and 7) infants with fear of feeding (Berall, 2009). This is the categorization scale that will be used in the current study with the exclusion of colic as that category pertains to children under 3 months of age.

As one can note, all the recently proposed categorizations are quite similar and reflect the current population with FDs seen in practice. Table 2 outlines the terminology and diagnostic criteria to compare the proposed classification systems.

Measurement Instruments

Tools available for screening and assessment of paediatric feeding are few and scarce. A number of tools were designed to assess meal time behaviours and are general, while others pertain to a specific clinical area or category of feeding difficulties. For example, an assessment scale was designed for children with severe feeding disorders, who are fully or partially tube fed, in order to help clinicians assess progress from tube feeds to solid foods (Crist et al, 2004).

A great tool has been developed by an occupational therapist for children with sensory aversions, who are also often known to be selective eaters. This tool is called the Winnie-Dunn sensory profile, and it allows researchers to establish the type of sensory processing difficulties a child may have,

Table 2: Proposed Classification Systems for Feeding Disorders of Early Childhood

RESOURCE	DISORDER CLASSIFICATION
DSM-IV-TR (2000)	<ul style="list-style-type: none"> -Feeding Disorder of infancy or early childhood -Rumination disorder -Pica
Chatoor's subtypes (2002)	<ul style="list-style-type: none"> -Feeding disorder of state regulation -Feeding disorder of reciprocity (neglect) -Infantile Anorexia -Sensory food aversions -Feeding disorder associated with concurrent medical condition -Posttraumatic feeding disorder
Emder et al. (2005)	<ul style="list-style-type: none"> -Feeding disorder of state regulation -Feeding disorder of caregiver-infant reciprocity -Infantile Anorexia -Sensory food aversions -Feeding disorder associated with concurrent medical condition -Feeding disorder associated with insults to gastrointestinal tract
Glenn Berall (2009)	<ul style="list-style-type: none"> -Children with poor appetite due to organic cause -Children with poor appetite due to parental misconception -Children with poor appetite, but otherwise vigorous -Children displaying highly selective feeding behaviours -Children who fear feeding -Children with colic that interferes with feeding
ICD-10 (2010)	<ul style="list-style-type: none"> -Feeding disorder of infancy and childhood -Pica of infancy and childhood

to what extent they may be impairing usual daily activities and what interventions may be most appropriate (Tomchek and Dunn, 2007). While it is not specific to feeding only, relevant components may be helpful in assessing this type of FD.

Another instrument that has been created is the Children's Eating Behaviour Inventory (CEBI), which is a reliable, validated parent-report questionnaire intended to assess feeding and mealtime problems (Archer et al, 1991). While the CEBI is easy to use, it is intended for a very wide range of ages and medical conditions and consists of numerous questions. It is difficult to use the same questionnaire for infants, preschoolers and older children as the nature of feeding problems varies significantly. It does not question frequency or intensity of behaviours, making it unsuitable for clinical practice use. Furthermore, distinct tools are needed for children with developmental delays or other specific medical conditions and those who are normally developing as their medical and thus feeding needs and skills differ too greatly (Odar et al, 2010; Crist et al, 2004).

Similarly, the Behavioural Paediatric Feeding Assessment Scale (BPFAS) is another validated tool created to assess mealtime behaviour (Crist and Napier-Philips, 2001). It is a parent reported questionnaire that contains 25 child behaviours and 10 parental behaviours and uses a five-point Likert scale to determine frequency of occurrence. The BPFAS has been used in several populations from Type 1 Diabetes and cystic fibrosis to overweight children. It has been recommended that the BPFAS be modified and validated for different patient populations. This scale is used to assess meal time behaviours across different ages and medical histories rather than serving as a screening or assessment tool (Crist and Napier-Philips, 2001; Odar et al, 2010).

Another questionnaire was created for parents based on categories for pickiness, food refusal, struggle for control and positive parental behaviour (Lewinsohn et al, 2005). The tool comprised of the most relevant questions pooled from all other existing questionnaires previously mentioned. The purpose was to measure prevalence and correlations between problematic feeding behaviours by administering questionnaires to mothers in the community. The usability of the results may be limited as the questionnaire has numerous items but does not consistently measure frequency and/or intensity of behaviours and was administered at one point in time. The survey helps capture some aspects of feeding problems using a factor system created by authors,

but this factor system is not used anywhere else in the literature or in practice, making the results less relevant.

A rating scale was also created for feeding observations with a goal of identifying infants with feeding disorders based on the observation of mother-child interactions. This rating scale has 46 parent and child behaviours and has shown to have good predictive validity (Chatoor et al, 1997). However, this scale was tested and validated based on old DSM criteria and definitions that are no longer utilized. It also has very specific applicability as it is meant to be used during direct mealtime observation only.

All these scales may be helpful in research as they can show incidence and characterize meal time problems. However, there is limited clinical application as none of these look at all behaviours present and which behaviours predominate and more importantly, which behaviours may correlate with difficult FD cases or different FD subtypes. Some of these tools may be helpful in specific situations and others are very general, but no instrument has been widely accepted in the assessment of BFPs in normally-developing, young children.

Interventions and Outcomes

Few published studies on FDs have analyzed the effectiveness of feeding program interventions (Davis et al, 2010). A recent meta-analysis looked at 48 studies on severe FDs and its treatment modalities and outcomes (Sharp et al, 2010). The interventions described in these studies were primarily behavioural and a few studies mentioned family, sensory and psychodynamic therapies. Furthermore, effectiveness of interventions, even behavioural, was often not reported on. This meta-analysis included 48 studies with a yield of 96 participants aging between 10 months and 14 years. Most of the selected publications were case studies and no study had more than 5 participants. Among all the participants, 45% were tube fed, 10% were normally developing, 66% had developmental delays and 24% had no report on developmental issues. The most common behavioural therapies in the studies included escape extinction (EE), differential reinforcement (DR) and non-removal of the spoon (NRS). To exemplify, EE refers to ceasing reinforcement for a negative behaviour, while DR refers to applying reinforcement with a correct behaviour and no reinforcement with an undesired behaviour. Outcome data was overall limited and most outcome measures were behavioural. The most common measures were amounts of food consumed, acceptance of food and swallowing ability. Only 24% of the cases reported

anthropometric measures, 12% reported changes in food volume following treatment, 34% percent reported increased variety using specific number of foods and 58% of tube-fed cases reported changes in feed volumes (Sharp et al, 2010). This meta-analysis review demonstrated that while central treatment modality in FDs is behavioural, there is a lack of treatment evaluation, no consistent terminology for behavioural treatment options and no set of desirable outcome measures. The outcome measures in the case of FDs are often difficult to obtain and the ambiguity and lack of definitions in assessment and treatment makes it very challenging.

An inpatient program for feeding disorders published a description of their patient population, program, assessment process, interventions, and outcomes. More than 50% of the patient population presented with developmental delay and the mean age was three (Babbitt and Hoch, 1994). The focus of treatment therapy was also behavioural management and the main guiding principles were on increasing appropriate behaviour and decreasing maladaptive behaviour. The behavioural approaches included positive reinforcement, antecedent manipulation, differential reinforcement, skill acquisition and parent training. In the evaluation of outcomes, authors reported that out of 40 patients all had an increase in the amount of food consumed by discharge time (weighed in grams), 10% of patients started self-feeding, 29% progressed to a more advanced texture and 86% of tube-fed patients switched to solids by discharge time. Furthermore, average admission duration was 60 days and the average weight gain was 0.8 kg (average monthly weight gain for a 2 year old is 0.17 kg) (Babbitt and Hoch, 1994.) Also, ideas for potential success measures were provided, such as follow up after discharge at specific time intervals and satisfaction questionnaires. Limited data is available on follow up appointments as they often may not be part of the program design. The interventions protocol and behavioural interventions used at the clinic under study, albeit termed differently, resonate with strategies described in these studies.

Other specialists working in similar settings quoted different treatment options such as appetite manipulation and contingency management. Appetite manipulation implies that children are best motivated to change their eating behaviours by allowing them to feel their hunger, which parents often impede as they are anxious to feed the child and the consumption of food itself can serve as a positive reinforcement (Linscheid, 2006). Although this is believed to be the most effective treatment therapy by many, it is one of the most challenging for parents to carry out.

Contingency management consists of positive and negative reinforcements. Some examples may include limiting meal time duration, restricting snacks, time-out during tantrums, providing positive feedback and social praise. However, the success of these strategies is mostly reported in case studies or small sample retrospective studies.

One larger study looked at 121 children who were categorized as selective eaters, tube fed or depended on liquids (>75% fluid) to evaluate the impact of an intensive interdisciplinary program on child's health and caregiver stress (Greer et al, 2008). Treatment consisted of three hours of behavioural therapy and one hour of oral motor therapy per day. However, treatment details were not outlined anywhere. The outcome measures included parental stress levels, using the Parenting Stress Index questionnaire, food acceptance (food taken within five seconds), mouth cleans (food swallowed within 30 seconds), negative vocalizations, oral intake and child's weight. The results showed that 42% of parents in the sample experienced clinically significant stress levels, but they did not differ between feeding problem categories. A higher CEBI score did predict higher total parental stress levels at admission. At discharge, 30% of caregivers exhibited clinically significant levels of stress down from 42%. There was also a significant decrease in total eating problem score with no differences across feeding categories. Finally, there was a significant increase in all outcome measures including weight, acceptance, oral intake, and mouth cleans. There was a significant reduction in negative verbalizations (Greer et al, 2008).

Parental guidance and education are central to the management of FDs, but instructional procedures for caregivers have not been adequately described in the literature. It has been found that didactic education is not the optimal method. Competency-based training, involving a step-by-step approach with hands-on examples, role playing and immediate feedback are most effective when managing these cases (Manikam and Perman, 2000). A more specific description of parent training was given in a paper outlining the functions of a paediatric feeding disorders clinic (Babbitt and Hoch, 1994). At this particular clinic, parents initially observed the feeding sessions led by a clinician then were trained on behavioural management skills in between sessions. After the parents demonstrated proficiency in using these skills, they were systematically taught to implement the feeding protocol.

From the results of these investigations, it is evident that there is need for standardized nomenclature system for these behaviours to help establish diagnosis, treatment goals and outcomes. Although behavioural therapy in FD has been demonstrated to be successful, literature on this mode of treatment is usually limited to successful case reports (Linscheid, 2006). There are no published studies looking at the effectiveness of both nutritional and behavioural interventions on children with feeding difficulties. Overall, there is limited literature examining the impact of multidisciplinary approach to treating feeding difficulties by analyzing all possible factors including the organic, psychological, environmental and behavioural characteristics of the child and caregivers. Finally, there are not many studies looking at any type of FD in a population of healthy, normally-developing children, making it more difficult to understand the nature and optimal treatment for this problem at baseline.

Significance of the Interdisciplinary Team

Lastly, it is important to acknowledge the significance of having an interdisciplinary team available to address the different aspects of children's FDs. Interprofessional care is defined as "the provision of comprehensive health services to patients by multiple health caregivers who work collaboratively to deliver quality care with and across settings" (Health Force Ontario 2007). To exemplify this, an Ontario hospital has implemented and evaluated an interdisciplinary education program for children with FDs involving an occupational therapist, a registered dietitian, a psychologist and a speech language pathologist (Owen et al, 2012). The program provided education and support for the parents over a course of five sessions. The effectiveness of this approach was evaluated by assessing children's feeding behaviours and parents' ability to implement recommendations as well as their emotional reactions at meal times before and after the intervention (Owen et al, 2012). The results of the study showed a decrease in children's problematic feeding behaviours, an increase in parents' ability to follow instructions, reduced stress levels among family members and an overall satisfaction with the program. A number of other specialized groups published a description of their feeding clinics' operations, role of each health discipline, and population description along with case study examples (Babbitt and Hoch, 1994). Many of the studies referenced earlier in this paper also mentioned the interdisciplinary approach used in their clinics and the significance of a specialized team to address such a multifactorial issue.

Despite the described success and the logical comprehension that this is the optimal approach to addressing feeding difficulties, few clinics conducted evaluations to demonstrate achievements empirically. Unfortunately, measuring the feasibility and benefits of having such a diverse team readily available is a challenge. Important questions to ask and consider may include which specialists are most essential, what is the most economical and feasible model for a paediatric feeding clinic, and how does one best measure the impact of the clinic when a bio-psychosocial issue is being addressed and all its factors have to be accounted for. Lastly, the role of the registered dietitian is infrequently cited, despite the fact that the issue at hand is nutrition-based and no other clinical staff member has the appropriate training to guide parents on what constitutes a balanced diet that will yield appropriate weight gain and ensure a balanced intake of all macro- and micro-nutrients. A registered dietitian (RD) is also the specialist who would guide the family on what constitutes an appropriate feeding environment and feeding techniques, thus addressing all the problematic behaviours. This makes the RD an essential member of the feeding team since in addition to organic causes, nutrition-related behaviour and nutrition itself are the main influential issues when dealing with a population of normally-developing children.

Summary

All the evidence cited thus far outlines the potential long-term effects of behavioural feeding disorders, models of care that may work best as well as the need and continuous attempts to clarify, organize and evaluate the characteristics of this population and the best approach to it. Most importantly, it is evident that no consensus has been reached on understanding and defining feeding disorders. There is limited research on and development of screening and assessment tools as well as treatment protocols for children with BFPs. Considerably more time and effort has to go into studying this field and beginning with understanding and characterizing the basic, non-complex population presenting with BFPs may be the best start.

Chapter 3

METHODOLOGY

The following chapter describes all the procedural steps that were followed to complete this research study. The inclusion and exclusion criteria, description of the patient population, as well as methods and processes for data collection and analysis are all outlined below. The study was approved by the University of Western Ontario Research Ethics Board for Health Sciences Research Involving Human Subjects (HSREB) in June, 2013. A copy of the ethics approval for the chart review can be found in Appendix A. Letters of information and consent were also signed by the collaborator, Dr. Glenn Berall, who manages the pediatric clinic where this study took place (see appendices B and C).

Data Collection

The paediatric clinic where this study took place, stores all the patient charts alphabetically, and keeps them on site for approximately one year after the patient's last visit. Once the patient has not been in the clinic for over twelve months, he/she is discharged and would require a new referral and thus a new medical chart would be started. Charts of patients who have not returned for an appointment in over one year are transferred to an external storage site. The review and partitioning of old charts is usually done annually, depending on the workload of the administrative staff. Based on the dates of the initial visits, all the patients in this study attended the clinic within the last five years. The data was collected over a period of eleven months, between June, 2013 and April, 2014.

During the data collection process, one personal identifier was gathered - the patient's full name. Each case received a three-digit code which was used in place of the patient's name throughout this research. There is one master copy that contains the patients' names and their corresponding codes. This master list was stored onto one password-protected laptop which, during closed clinic hours, was located in the physician's office at the paediatric clinic. With the exception of the safely stored master list of the names and the corresponding three-digit codes, there was no other identifying information collected in this study.

A preliminary process of identifying all charts that met the inclusion criteria and coding them, took place prior to the actual data collection. This was done to ensure all medical charts meeting the inclusion criteria remained in the office and did not get transferred to external storage. This was also done to ensure these charts did not get omitted, because these may at times be filed in different locations throughout the office. For example, if patients need a referral to a specialist or if they have an appointment the following day, the charts get temporarily filed in a different location within the clinic. The duration of this process was approximately ten hours as nearly one thousand charts were stored in the clinic. In January, 2014 all filed charts were reviewed one more time to ensure no pertinent cases were missed. Three more patient charts appropriate for inclusion in this study were identified at that time.

Inclusion and exclusion criteria

The charts of patients were included when the following criteria were met: patients were between six and 48 months of age and referred for any type of feeding difficulty, weight loss or for a medical condition in combination with feeding difficulties. Patients were typically referred by paediatricians, family doctors as well as hospital inpatient units and other paediatric specialists or interdisciplinary health care providers. Common reasons for a referral would include weight loss, failure to thrive, difficulty feeding, slow weight gain and picky eating. When a patient had a medical condition only and no other feeding problems were present, their chart was excluded. Other exclusion criteria were children younger than six or older than 48 months of age, those with genetic disorders, physical and/or mental developmental delays, colic and those who were tube fed. It is essential to exclude patients who have complex medical diagnoses, such as cerebral palsy, as their feeding challenges and corresponding interventions are considerably different. For instance, the use of tube feeds, need for a swallowing assessment and prescription of specific textural consistencies not corresponding to age are common in patients with a more complex diagnosis, such as cerebral palsy. Patients who failed to follow up after the second appointment and had no further appointment booked were also excluded as not enough data would be available to obtain the required outcome measures. Patients who had further follow-up appointments booked were kept on the list.

Sampling and sample size

Originally, there were a total of 143 charts available. Thirty seven of the charts were later excluded due to the following reasons: diagnosis of a new condition that fits the exclusion criteria at a later visit (such as autism), transfer of care to a different specialist, and initiation of tube feeds. Three of these cases met the inclusion criteria upon the initial review, which used information from the first appointments, however, new medical developments took place. At a later point in time these patients were diagnosed with developmental delay, hyperphagia and autism. Seventeen patients had data for two appointments or less as there was failure to follow up, which meant they met the exclusion criteria. In one case, the patient's age was initially miscalculated and she/he was over 48 months of age. Sixteen charts went missing after the initial identification of participants, and the researcher (JS) along with the administrative staff were unable to retrieve them as they were moved to external storage erroneously. After all these cases were excluded, a total of 106 charts were available.

Initially, stratified random sampling was attempted to ensure all age groups are proportionately represented and a similar sample size was to be used for each of the following age groups (in months): 6-11, 12-23, 24-35, and 36-48. However, there were not enough charts available to conduct random sampling and thus all the cases meeting the inclusion criteria were utilized. All age groups contained a similar number of patients, with the exception of the eldest stratum, which had significantly fewer patients. There were 26 charts for the 6 to 11 months of age group, 40 charts for the 12 to 23 months group, 30 charts for the 24 to 35 months group and 10 charts for the 36 to 48 months group. This was anticipated because as the child gets older, different types of feeding behaviours begin to exhibit themselves (Steinberg, 2007). For instance, consumption of inappropriate textures, such as purees is much less common in a four year old than in a one or two year old.

Chart review

The data was collected and analyzed by a Registered Dietitian (JS) with specialization in feeding difficulties. Two senior nutrition students assisted in data collection. They were third year students enrolled in the Food and Nutrition program at Ryerson University. Their resumés and cover letters were reviewed for relevant knowledge and experience and they were interviewed prior to commencing their volunteer role. The only role of the student volunteers was data collection. They were educated on the topic of feeding difficulties and trained on the data

collection procedures. A colour-coded legend was created to assist the students in communicating potential challenges and questions during this process. The legend included three categories: “unable to read or interpret information,” “missing data,” and “unable to locate chart.” Whenever one of these issues arose, students flagged the chart and communicated the issue to the RD. All their work was reviewed by the RD (JS).

Abstraction sheets were created by the RD to encompass all the necessary data (see Appendices D and E) and were based on typical information that is collected by the health care providers during initial and follow up appointments. There are no standard guidelines for reporting medical record reviews and there is limited research on methodology and best practices for collecting data for a retrospective chart review (Worster and Haines, 2004). The abstraction sheets utilized in this study were created using existing recommendations. Some of these recommendations include training the abstractors, establishing explicit terms and definitions, establishing rules regarding missing, conflicting and ambiguous data, clearly identifying inclusion and exclusion criteria, and advising the abstractors in advance that their work will be reviewed (Worster and Haines, 2004; Banks, 1998). All of these recommendations were incorporated (as described earlier) with the exception of a review of the principal researcher’s work as no clinical staff member was available to do this.

Since there was only one source of information, only two types of abstraction sheets were used: one for the initial appointment and another for the follow up appointments. There was a need to create two separate forms, because during the initial assessment more information, such as a detailed patient and family medical history, was collected. It was also recommended to record information in the same order as it appeared in the medical form, in a clear well defined format (Worster and Haines, 2004; Banks, 1998). Therefore, the abstraction sheets were based exactly on the interview/assessment forms utilized in the clinic (Appendices F and G). All the information on these assessment forms was collected in the same order of appearance, using the abstraction sheets with clearly defined categories and designated spaces for each separate piece of information (Appendices D and E). To maximize precision and minimize the risk of missing data, all the information, qualitative and quantitative, were recorded as written in the medical chart. Data was recorded directly into the computer, as opposed to paper, to reduce risk of error and maximize efficiency. There was a variation in the number of appointments for each case

(from three to over the 30), but on average it took 45 to 60 minutes to complete the abstraction forms for one case. These abstraction sheets were developed to facilitate accurate data transcription and they allowed an easy data entry process for analysis. After all the necessary information was recorded on the abstraction sheets and verified, it was transferred to an Excel spreadsheet for data analysis.

Data collected and transferred to Microsoft Excel, 2010 included the number of visits, age (in months), gender, reason for referral, weight, length/height, ideal body weight, medical history, medications, supplements, brief dietary history and all parental and child behaviours related to feeding. Assessment statements and recommendations were also recorded. Response to treatment was also recorded as reported and it usually consisted of changes in dietary habits, feeding behaviours, symptoms and weight. Essentially all of the information were collected from the chart with all its details, but not all of it was utilized in this study. The co-investigators and the researcher made the decision to collect all these data, as it may be utilized in a different chart review or investigation in the future, if there was no opportunity to utilize it in the current chart review. Therefore, some of the collected information such as allergies, medications and treatment plans were not used in the data analysis as these did not assist in meeting this study's objectives.

There were a number of medical issues that most commonly presented in this sample and they included gastroesophageal reflux disease, constipation, and allergies. Although specific medical issues were recorded in the abstraction sheets, once cases were transferred into Microsoft Excel 2010, they were divided into two groups: those who had concurrent medical issues (organic) and those who did not (non-organic). Number of visits and the time lag, in weeks, between visits were also collected. The time interval between appointments varied between three days and 12 months. However, in most cases follow up appointments were booked two to six weeks apart. Number of visits included the initial visit, feeding observations and the total number of follow up appointments, which varied between two and thirty. Feeding observations were appointments dedicated to a direct observation of a feeding session either in the clinic or at a patient's home. The number of visits was crucial, because it was used as a marker to determine whether a case is non-complex or difficult and thus non-responsive to treatment. Furthermore, the number of visits required to reach complete resolution of the feeding issue was recorded. Data on complete

resolution of feeding issues were largely limited by lack of follow-up as well as by cases of patients who continued attending the clinic although most issues may have been resolved. It was also possible that once families perceived a satisfactory level of improvement they may not have felt the need to continue seeing the specialists.

Weights and lengths (or heights in older children) were recorded in kilograms and centimeters, respectively. These measurements were used to plot the data on the growth chart, if it was not plotted already, and calculate percent ideal body weight (IBW) whether it was recorded in the chart or not. When the measurements were plotted and the ideal body weight calculated, the researcher double checked that the plotted graph and the recalculated IBW were correct to ensure accurate results. All the plotting and re-calculations were done by the researcher even when data was available, to ensure accuracy. Percent ideal body weight (IBW) was calculated based on the growth charts. Although there is no consensus on the ideal body weight definition or measure, it is an integral component of paediatric assessments and is consistently used in paediatric practice. There are several ways to calculate IBW and the method used at this clinic was the Moore method. The Moore method uses the same standard deviation from the mean of a child's height for age to calculate the optimal weight using growth charts (Phillips et al, 2007). Both, the Centre for Control and Disease Prevention (CDC) growth charts and World Health Organization (WHO) growth charts were used (WHO, 2006; CDC 2002). WHO growth charts were used in the clinic if the child was born after introduction of these charts. Another category was created for underweight children who were small for gestational age (SGA). Infants who are small for gestational age plot below 10th percentile for length and weight. Typically this definition is general and does not distinguish between infants who are underweight and those who are constitutionally small due to genetic factors (Mandy, 2014). However, at the clinic, physical examination and assessment were used by the paediatrician to determine which infants were underweight when they were of small size. One of the basic parameters was the visual assessment of adipose tissue stores, for instance if a child is presenting with a flat or concave abdomen they are very likely underweight. Children who presented as small for gestational age were separated into a category of their own as percent ideal body weight would not be appropriate to use, because the weight and the length may be on the same standard deviation curve but they plot on the lowest percentiles and are underweight in appearance. All the available weights and lengths/heights were recorded, albeit some values were missing, such as

lengths/heights at multiple follow-up appointments. However, for data analysis only initial weight and length/height were used to plot the child's measure on growth charts and calculate percent IBW. All of the available weight measures were used to calculate average monthly weight gain. The last anthropometric parameter used was average weight change per month between the initial visit and the last appointment. This was calculated by adding up all the weight measures and dividing by the number of total months between first and last appointments. These anthropometric measures were collected to determine whether lower weight or rate of weight change associate with number of visits, responsiveness to intervention or specific problematic behaviours.

All behaviours written in the charts were recorded verbatim, later labeled with a common identifying name and then further grouped into broader categories by the RD. The behaviours were recorded based on parents' report as well as questions asked by the health care provider. Although a number of studies used different nomenclatures or labels for problematic feeding behaviours, this research aimed at collecting all behaviours described or observed during visits by parents and clinicians and recorded in the charts. This method allowed the researchers to identify what behaviours were typically present, which will be needed in the future design of a screening tool. Although the wording differed from case to case, generally the same behaviours were reported, which made it easy to compile a list of parent and child behaviours that are described in the "Results" chapter. Although some behaviours appeared very similar for both parent and child, the initiator of the behaviour would determine which party it was designated to. For example, excessive fluid intake was present under parent and child categories, because in some cases parents provided excessive milk and limited amounts of solids, while in other cases the child may have refused solids and accepted milk or fluids only. The collection of behaviours was one of the essential components of this research, as distinct problematic behaviours have been known to be characteristic of different types of feeding problems. For example, a child that strongly dislikes his or her hands being dirty and is very sensitive to brushing hair or other tactile sensations is likely to have a degree of sensory aversion. Finally, one of the goals of this research was to identify whether any specific, problematic behaviours are associated with responsiveness to treatment or difficulty of a case.

Patients were grouped into responsive and non-responsive categories to differentiate between those who responded to intervention within what was deemed an appropriate time frame and those who may be considered more complex as they require longer treatment. Decreased frequency or cessation of a problematic feeding behaviour by parent or child as reported by caregivers/parents was considered an improvement. A non-responsive case was defined as the patient with no reported success or improvement in feeding by the fourth appointment. The goal of this distinction was to determine whether there was an association between certain behaviours and the difficulty of the case.

Data analysis

The two-tailed t-test assuming unequal variances and a single factor ANOVA test were used to analyze whether there are associations between the variables of interest. The two-tailed T test was used, because the sample population was divided into two groups: responsive and non-responsive and the goal was to determine whether one of these groups has an association with another variable such as low IBW, presence of a medical issue or a specific behaviour. Since the aim of the analysis was to determine whether there was any statistically significant difference between these two groups and there was no specific, anticipated outcome (such as non-responsive group was associated with a greater likelihood of a medical issue being present), the two-tailed t-test was ideal to examine these differences. The ANOVA test was also appropriate given the variables under investigation and offered an analysis of differences between the means of two groups to provide additional support for the t-test results. These tests were 2-sided and considered significant at $p < 0.05$. The confidence interval was set at 95%.

These tests were used to analyze whether there are differences between the responsive and non-responsive groups in the number of visits, number of problematic behaviours present, occurrence of low ideal body weight, average monthly weight change and the presence of medical issues. After the data was collected, it was decided to conduct additional analyses. For example the sample was also divided into other groups, such as patients with and without a medical condition, to determine whether there is a difference in the number of visits or the number of behaviours between these two groups. The same tests were used to check for an association between groups where parental stress was or was not reported against the same parameters.

Descriptive statistics, including all values of central tendency and dispersion, and the two-tailed Z test were used to look for differences in two population proportions to determine what types of specific behavioural issues occur more frequently between the responsive and non-responsive groups as well as which behaviours may be associated with a greater number of visits. For the Z test, alpha value of 0.2 was used, allowing for 10% in the tails of the normal distribution curve and leaving 90% of the body as normal distribution range.

Summary

Data was collected at an outpatient paediatric clinic specializing in feeding and nutrition. This clinic was an ideal place to investigate the current topic, as one of the common issues encountered in this practice was feeding difficulties in infants and toddlers. Furthermore, a limited number of facilities in Toronto specialize in children's feeding difficulties, this location being one of the few. This study was a pilot, observational retrospective study consisting of a chart review, which incorporated all available patient cases that met the inclusion criteria. The goal of the review was to obtain data on all behaviours reported in patients with feeding difficulties as well as all the other relevant factors from the medical chart that would allow an investigator to see the full picture of FDs, how they present, how they progress and how they respond to treatment. The results from this review will help add to the existing body of literature and become a stepping stone for creating a screening tool that could help identify the type or types of feeding difficulties present and the potential complexity of the case.

Although the initial objectives of the study included the development and pilot-testing of a screening tool or ranking scale, it was determined subsequently by the researchers that this process necessitated a more complex validation study and a much longer time frame to complete. It was recommended that this phase of the project be a continuing future project for the clinic to pursue. Therefore, the development and validation of the tool is not part of this thesis report.

Chapter 4

RESULTS

This chapter describes the demographic characteristics of the sample, the statistical analyses performed, and results for all outcome measures that were examined. The results for each outcome measure are separated by subheadings and are tabulated to help illustrate the findings.

Outcomes

All the available charts meeting the inclusion criteria were used, yielding 106 patients. Forty three percent of the participants were females and 57% were males. The percent of patients in each age strata were proportionate with the exception of the eldest group being significantly smaller. Twenty seven percent of the patients (n= 26) were 6 to 11 months of age, 38% (n= 40) were aged 12-23 months, 28% (n= 30) were between 24 and 35 months and 9% (n=10) made up the 36 to 48 months group. This smaller sample for the eldest age group was anticipated because as children get older they present with different types of feeding challenges. After two-three years of age, some feeding challenges such as mechanical issues involving difficulty swallowing and chewing or behavioural issues such as lack of self-feeding or force-feeding by parent are less and less likely to be present. This happens because the child has met some of the crucial feeding milestones, such as texture progression and has gained more physical and emotional autonomy (Steinberg, 2007).

Thirty three percent of the patients presented with a medical issue in addition to feeding difficulties. The more common concurrent organic problems were gastroesophageal reflux disease and allergies. Twenty five percent (n = 32) of the population were in the non-responsive category, which signified that children did not respond to treatment by the fourth appointment. This meant that 75% (n = 74) of the patients were responsive to treatment within an effective time frame (between the initial appointment and the fourth visit).

The null hypothesis postulated that the presence of more behavioural feeding problems (BFPs) and the types of behaviours would not be associated with a greater number of appointments or a

slower responsiveness to treatment. Furthermore, it was hypothesized that children with lower initial weights and/or smaller monthly weight changes were no different than normal-weight children in responsiveness to treatment or number of visits to clinic. The null hypothesis was partially rejected as there was a statistically significant difference between the number of problematic behaviours present and responsiveness to treatment as well as the number of visits to the clinic and responsiveness to treatment. The more behaviours were exhibited in a case and the more visits to the clinic the patient had, the more likely they were to be complex cases. The null hypothesis was affirmed with regards to anthropometric measures, as there was no association between case responsiveness and initial weight status or growth velocity.

Visits and Behaviours

The total number of visits for the whole sample was calculated; the mean and standard deviation (SD) were computed. Furthermore, differences in the number of visits between the responsive and non-responsive groups were analyzed. The mean for total visits was $6.91 \pm 4.94SD$. The patients in the responsive group had a mean of $5.30 \pm 2.99SD$, while the non-responsive group had a mean of $10.63 \pm 6.42SD$, ($p < 0.0001$). Some of the key descriptive statistics are outlined in Table 3, including mean, median, mode, standard deviations and p values where appropriate.

The mean and SD were calculated for the total number of behaviours present in each group, parent and child, and the sum of all behaviours for both. Differences in the average number of behaviours for all these groups were compared between the responsive and non-responsive categories to determine whether increased number of behaviours was associated with the difficulty level of the case. The mean number of total behaviours, parent and child combined, was $6.37 \pm 3.01SD$. The average number of behaviours exhibited by the child was $2.65 \pm 1.93SD$ and for the parents the mean was $3.72 \pm 2.05SD$. Parents and children in the non-responsive group exhibited a greater number of BFPs. The average number of children's problematic behaviours in the responsive group was 2.03 and in the non-responsive group 4.09 ($p < 0.0001$). Similarly, the average number of parental problematic behaviours in the responsive group was 3.30 and 4.69 in the non-responsive group ($p < 0.005$). Consequently, overall number of problematic behaviours is higher in the non-responsive group at 8.78 compared to the responsive group with an average of 5.32 behaviours ($p < 0.0001$).

Parental Stress

Parental stress and anxiety was a behaviour that was singled out for analysis as previous literature has shown that it may have a significant impact on feeding issues. The goal was to determine whether there was a relationship between parental stress and number of visits or number of BFPs displayed. In 13% of the cases parental stress was explicitly recorded as a separate behaviour. There was no screening tool that allowed for a consistent assessment of parental anxiety and stress and this was typically recorded when overt signs of high stress levels were noted by the health care provider or expressed by the parent.

Table 3: Demographics, number of clinic visits and number of behaviours displayed

Parameter	Cases	P
Sex (M/F), %	57/43	-
Total # of visits, mean \pm SD (median)	6.91 \pm 4.94 (5)	-
Total # of visits in responsive patients, mean \pm SD (median)	5.30 \pm 2.99 (4)	p<0.0001
Total # of visits in non-responsive patients, mean \pm SD (median)	10.63 \pm 6.42 (9)	
Total # of behaviours, mean \pm SD (median)	6.37 \pm 3.01 (6)	-
Total # of behaviours in child, mean \pm SD (median)	2.65 \pm 1.93 (2)	-
Total # of behaviours in parent, mean \pm SD (median)	3.72 \pm 2.05 (4)	-
Total # of behaviours in responsive cases, mean \pm SD (median)	3.30 \pm 1.91 (3)	p<0.0001
Total # of behaviours in non-responsive cases, mean \pm SD (median)	4.69 \pm 2.05 (4)	

When the incidence of parental stress was compared between responsive and non-responsive groups, no statistical significance was found as there were 8 cases in the responsive group and 6 cases in the non-responsive group ($p = 0.12$). The number of BFPs was also compared between stress and non-stress cases. The cases in which parental anxiety was noted had an average of 5.42 behaviours whereas cases without stress as a factor had 6.0 behaviours ($p = 0.41$). Lastly, the average number of visits to the clinic for the stress group was 9.0 and for the non-stress group it was 6.6 ($p = 0.08$). Although this result only approaches statistical significance, it may be very

important, because despite the shortcomings of collecting data on parental anxiety and the small number of parents reporting stress ($n=14$), the trend of greater number of visits for families showing overt stress and anxiety levels was still notable.

Analysis of anthropometric measures

IBW was divided into two groups: low weight, which encompassed children who fell under 90% of their ideal body weight and normal weight, which included children who were between 90%-110% of the ideal body weight (Waterlow, 1976). The goal was to help determine whether there was an association between low weight and number of visits and number of BFPs. The mean IBW for the normal-weight group was 99.43% and the SD was 7.26. The mean for the low-weight group was 84.83% and the SD was 3.27. In patients who were considered non-responsive, 41% had low ideal body weight at initial appointment. In patients who were considered responsive, 50% had low ideal body at first interaction showing that incidence of lower weights is equally prevalent in both groups ($p = 0.74$). The average number of visits for patients with low IBW was 6.5 and for those with normal IBW was 7.7 ($p = 0.31$). There was also no association between low ideal body weight and number of presenting problematic behaviours ($p = 0.09$). The average ideal body weight was also calculated for more common BFPs in children associated with less responsiveness to treatment. The range of IBWs was 93% to 98% with an average of 96% IBW and there were no cases of low IBW.

Twenty percent of the patients were diagnosed as small for gestational age (SGA). The SGA group was treated as a separate category as explained earlier. This group was compared to the normal IBW group for number of visits and behaviours. Average number of visits for the SGA group was 5.52 compared to 7.69 in the normal weight group ($p = 0.08$) and average number of behaviours per case was 5.71 and 6.9 in the normal weight group ($p = 0.13$). There were no significant differences in these factors when comparing small to normal weight babies.

Average weight change was also computed to determine whether there was a difference in growth velocity between the responsive vs. non-responsive group. The responsive group had an average weight change of 0.18 kilograms per month and the non-responsive group had 0.22 ($p = 0.41$). This also seemed to show that both groups responded equally well to the clinical interventions.

Patients with medical conditions

Associations with the presence of organic problems were also analyzed to understand whether medical conditions in addition to feeding issues related to duration of treatment or number of BFPs present. A total of 34 patients or 32% were identified as having an organic condition that met the inclusion criteria and coincided with feeding issues. In the responsive group, only 22% of the patients presented with a medical issue and in the non-responsive group 56% of the population had an organic problem of some sort. There was an average of 9.5 visits for patients with an organic condition, which was significantly different from 5.7 visits for patients without ($p = 0.00013$). There was also a trend towards significantly greater number of problematic feeding behaviours (BFPs) being present in cases with a medical condition, but no statistical significance was reached. There were 7.2 behaviours for cases with medical condition and 6.0 for cases without ($p = 0.04$). IBW in relation to medical issues was also examined. Average IBW for the organic group was 95 and 94 for the non-organic group ($p = 0.63$). To account for potential trends in the SGA group, the same analysis was conducted. In the organic group 12% of the patients were small for gestational age and 22% in the non-organic group.

Lastly, vomiting was isolated to check the association of this symptom with the presence of a medical condition and the responsiveness of the patient. A total of 21% of the patients ($n = 22$) presented with vomiting. Sixty-four percent of patients with an organic condition had vomiting as a symptom and 36% of patients in the non-organic group presented with vomiting. In the more difficult, non-responsive cases, 59% of the patients reported vomiting and 41% reported the same in the responsive group, showing no significant differences.

Problematic behaviours

Aside from looking at the total number of behaviours, descriptive statistics were used to determine the prevalence of specific behaviours reported for each patient and to show the distribution as percentages. A total of 21 problematic behaviours were recorded for children and 19 for parents. The more prevalent behaviours for children included refusing solids (10.32%), poor appetite (7.12%), not self-feeding when capable (6.76%), picky eating (10.32%), sensory issues (7.83%) and distress behaviours such as screaming, crying, turning head and having tantrums all grouped under one category (6.41%). The more prevalent parental behaviours

included not allowing to self-feed (11.68%), force feeding (7.61%), using distractions (11.42%), and providing excessive fluids from milk, breast milk or formula (12.44%).

To illustrate the differences in occurrence of behaviours, data were tabulated to show the percent of every behaviour as a total of all behaviours in the responsive and non-responsive groups. The prevalence of each behaviour as percent of the total child behaviours in responsive cases (n = 150) and total child behaviours in non-responsive cases (n = 131) are listed in Table 4. Same percentages are outlined for the total parent behaviours in the responsive group (n = 244) and the non-responsive group (n = 150) in Table 5. When examining the table, the more notable differences appeared to be as follows: the absence of swallowing which was present in 3.05% of non-responsive cases and in 0.67% of responsive patients; eating slowly which occurred in 3.05% of non-responsive versus in 1.55% of responsive cases and no signal or vocalization of hunger recorded in 4.58% of non-responsive cases and 2% of responsive cases. Other behaviours that were reported with greater frequency in more difficult patients included vomiting, mostly playing with food instead of eating, eating only with distractions, not chewing or pocketing foods and throwing food on the floor. On the other hand, behaviours that were more prevalent in the responsive group included refusing milk/formula (5.33% versus 3.82%), consuming excessive fluid (4.00% versus 0.76%), spitting food (4.00% versus 2.29%), showing no interest in food (5.33% versus 1.53%) and picky eating (14% versus 6.11%). These were the significant differences that were seen by the naked eye, but for several reasons, the results differed significantly when statistical analyses were applied.

The differences in frequencies of behaviours were analyzed, but due to the significant difference between the number of responsive and non-responsive cases (75% versus 25%) it was hard to produce statistically strong results using standard analytical tests. Due to the small sample size of the non-responsive group, a 95% confidence interval could not be used. Furthermore, the end point measures were also different, i.e., the total number of behaviours exhibited by all responsive children was 151, while in the non-responsive children it was 130, making the results less accurate. Despite this, these results added to and supported the bigger picture that will help in the future development of the screening/ranking tool.

Two-tailed Z analyses test for differences in the two population proportions was applied to determine which behaviours were significantly more likely to occur in the responsive or non-

responsive groups. An alpha value of 0.2 was used, allowing for 10% in the tails of the normal distribution curve and leaving 90% of the body as normal distribution range. As per Z table, this yielded a critical value of 1.29, meaning anything below -1.29 or above 1.29 is a rare event and would thus show a significant difference rejecting the null hypothesis. The formula used was

$$\frac{(\bar{p}_1 - \bar{p}_2) - 0}{\sqrt{\bar{p}(1 - \bar{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

. In Table 5, the behaviours that were outside of normal distribution as per Z scores and with significant P values are bolded. According to these scores, there was a significant difference in occurrence of picky eating, disinterest in food and excess fluid consumption and they were more likely to occur in less complex cases, that is, in the responsive group. Furthermore, not swallowing and eating with distractions only were more likely to occur in the non-responsive or more difficult cases.

Descriptive statistics were also used to show the distribution of parental behaviours as percentages. Similarly to the child behaviours, certain parent behaviours were also appearing more frequently in non-responsive cases. Providing inappropriate texture for age was observed in 9.33% of non-responsive cases and in only 4.92% of responsive cases. Other problematic behaviours that dominated in the non-responsive group included frequent wiping of hands and face, not allowing to explore or play with foods, paying excessive attention to the child, night feeding and offering excessive portions at meals. Some behaviours appeared less commonly in difficult cases, but were frequent in the responsive cases such as excessive duration of meals that was observed in 8.20% of responsive cases and in 4.00% of non-responsive ones. Other behaviours included frequent snacking, meals that lasted too long, catering to preferences, providing excessive fluids, offering juice and catering to preferences. Again, the differences listed above were ones that can be observed.

As with child behaviours, Z scores used the same formula and alpha value and thus critical values were also calculated for parent behaviours and the significant results are bolded in Table 5. Behaviours that were more likely to be present in the non-responsive group included inappropriate texture for age, offering excessive portions and not eating together. However, offering excessive portions is the behaviour that was least present in parents as it was reported only four times out of all the cases and thus may not be meaningful. Behaviours more likely

to occur in the responsive group included offering excessive fluids, offering frequent snacks, presence of juice in diet and meals lasting too long.

The analysis of how much each behaviour was present in the responsive or non-responsive group are shown in Table 6 for child behaviours and Table 7 for parent behaviours. Behaviours that vary >20% between the two groups, are highlighted.

To further support the above results, the number of visits for each of these BFPs was also analyzed for the responsive and non-responsive groups. The data on the number of visits per BFP showed that some of the children's behaviours were reported during more clinic visits in both responsive and non-responsive groups (Table 8 and Figure 1). Some of the most significant trends included the following: 62.84% of the patients who come in with low appetite were non-responsive to treatment. Similarly, 86.15% of patients who come in for problems with swallowing (reported as not swallowing) were not responsive to treatment and 84.62 % of the patients reporting no signals or vocalization of hunger were also non-responsive. Other behaviours that dominated the non-responsive group included refusing solids, throwing food on the floor, rejecting age-appropriate textures, eating slowly, not chewing/pocketing foods, eating only with distractions, mostly playing with foods instead of eating and vomiting. Only one behaviour, spitting food on the floor, occurred more frequently (71.62%) in the responsive group.

Table 4: Child behaviours in responsive and non-responsive groups as % of total behaviours

<i>Child Behaviours</i>	<i>Non-responsive</i>	<i>Responsive</i>	<i>P</i>
poor appetite/low intake	8.40%	6.00%	0.22
refusing solids	9.92%	10.67%	0.42
refusing milk/formula	3.82%	5.33%	0.27
excess fluid	0.76%	4.00%	0.038
not staying at the table/high chair	4.58%	5.33%	0.39
spitting food	2.29%	4.00%	0.2
throwing food on the floor	2.29%	1.33%	0.28
screaming, crying, tantrums/Turning head away/not opening mouth	6.87%	6.00%	0.39
not self-feeding, but capable	6.87%	6.67%	0.48
rejecting age-appropriate textures	3.82%	4.67%	0.36
not swallowing	3.05%	0.67%	0.07
eating slowly	3.05%	1.33%	0.46
not chewing/Pocketing foods	4.58%	2.00%	0.11
no interest in food	1.53%	5.33%	0.04
no signals/vocalization of hunger	4.58%	2.00%	0.11
eating with distraction only	3.82%	1.33%	0.09
mostly playing with food instead of eating/not active during feeding	3.05%	1.33%	0.16
refusal to try new foods	3.82%	3.33%	0.42
picky eating	6.11%	14.00%	0.014
sensory issues	6.87%	8.67%	0.29
Vomiting	9.92%	6.00%	0.11

Table 5: Parent behaviours in responsive and non-responsive groups as % of total behaviours

<i>Parent Behaviours</i>	<i>Non-responsive</i>	<i>Responsive</i>	<i>P</i>
Not allowing to self-feed	12.67%	11.07%	0.32
not allowing to explore/play with food	3.33%	2.05%	0.22
inappropriate texture for age	9.33%	4.92%	0.05
force-feeding/coercing to eat	8.00%	7.38%	0.41
frequent wiping of hands and face	2.00%	0.82%	0.17
excessive attention	4.00%	2.46%	0.2
bribing/rewards	2.00%	1.23%	0.28
frequent snacking/meal offerings/on demand	2.67%	5.74%	0.071
night feeding	7.33%	4.92%	0.17
excessive portions offered	2.00%	0.41%	0.081
Distractions	13.33%	10.25%	0.18
meals lasting too long	4.00%	8.20%	0.045
sleep feeding	0.67%	1.64%	0.19
not eating together	2.67%	0.41%	0.039
catering	5.33%	7.38%	0.21
excessive milk/formula/breastmilk/juice	8.00%	15.16%	0.022
offering juice	4.00%	7.79%	0.061
fluid before or with meals (juice/milk/water)	4.67%	4.92%	0.45
high stress and anxiety levels at meal time	4.00%	3.28%	0.36

Table 6: Child behaviours: as percent of responsive and non-responsive cases

<i>Behaviour</i>	<i>as % non-responsive</i>	<i>as % responsive</i>
low intake	55	45
refusing solids	45	55
refusing milk/formula	38	62
excess fluid	14	86
not staying at the table/high chair	43	57
spitting food	33	67
throwing food on the floor	60	40
screaming, crying, tantrums/Turning head away/not opening mouth	50	50
not self-feeding, but capable	47	53
rejecting age-appropriate textures	42	58
not swallowing	80	20
eating slowly	67	33
not chewing/Pocketing foods	67	33
no interest in food	20	80
no signals/vocalization of hunger	67	33
eating with distraction only	71	29
mostly playing with food instead of eating/not active during feeding	67	33
refusal to try new foods	50	50
picky eating	28	72
sensory issues	41	59
Vomiting	59	41

Table 7 Parent behaviours: percent as responsive and non-responsive cases

<i>Parent Behaviour</i>	<i>% as non-responsive</i>	<i>% as responsive</i>
not allowing to self-feed	41	59
not allowing to explore/play with food	50	50
inappropriate texture for age	54	46
force-feeding/coercing to eat	40	60
frequent wiping of hands and face	60	40
excessive attention	50	50
bribing/rewards	50	50
frequent snacking/meal offerings/on demand	22	78
night feeding	48	52
excessive portions offered	75	25
Distractions	44	56
meals lasting too long	23	77
sleep feeding	20	80
not eating together	80	20
Catering	31	69
excessive milk/formula/breastmilk/juice	24	76
offering juice	24	76
fluid before or with meals (juice/milk/water)	37	63
high stress and anxiety levels at meal time	43	57

The last two columns of Table 8 show the distribution of visits for each BFP as percent of the total behaviours. The most prevalent child BFPs in the non-responsive group were vomiting (11.59%), refusing solids (10.44%), picky eating (8.42%), poor appetite/low oral intake (7.75%), not self-feeding when capable (6.33%) and sensory issues (6.54%). Other prevalent behaviours in the non-severe group were picky eating (13.56%), refusing solids (10.09%), sensory issues (8.03%), not self-feeding when capable (7.59%) and not staying at the table/high chair (7.59%). .

Parental behaviours are represented in Table 9 and Figure 2. Overall, there were more parental behaviours collected (150) than child behaviours (130). Similar trends were observed in the data for parental behaviours. It was evident that some BFPs occur more frequently in the non-responsive group as shown in the first two columns of table 9. These behaviours included

providing inappropriate textures for age (72.37%), providing excessive attention during meal time, providing excessive portions (94.37%), using distractions (60.94%) as well as not eating together at meal time (86.49%) and exhibiting (by parents) high stress and anxiety levels (62.70%). A few behaviours that were more often present in the responsive group included frequent food and snack offering (68.22%), excessive fluids of any kind (62.21%) and sleep feeding (78.95%). However, sleep feeding was reported in very few patient cases and represented a small proportion of all reported behaviours, 5.87%. Sleep feeding is a technique typically suggested, in cases of post-traumatic feeding disorders, which in the current research setting, are rare compared to other types of feeding difficulties.

Some of the parental behaviours that were more frequently present in the non-responsive group included not allowing to self-feed (63.53%), using distractions (57.35%) and providing inappropriate texture for age (48.53%). In the responsive group, common behaviours included providing excessive fluid (54.59%), catering to preferences (27.04%) and offering juice (31.12%) (refer to Figure 2).

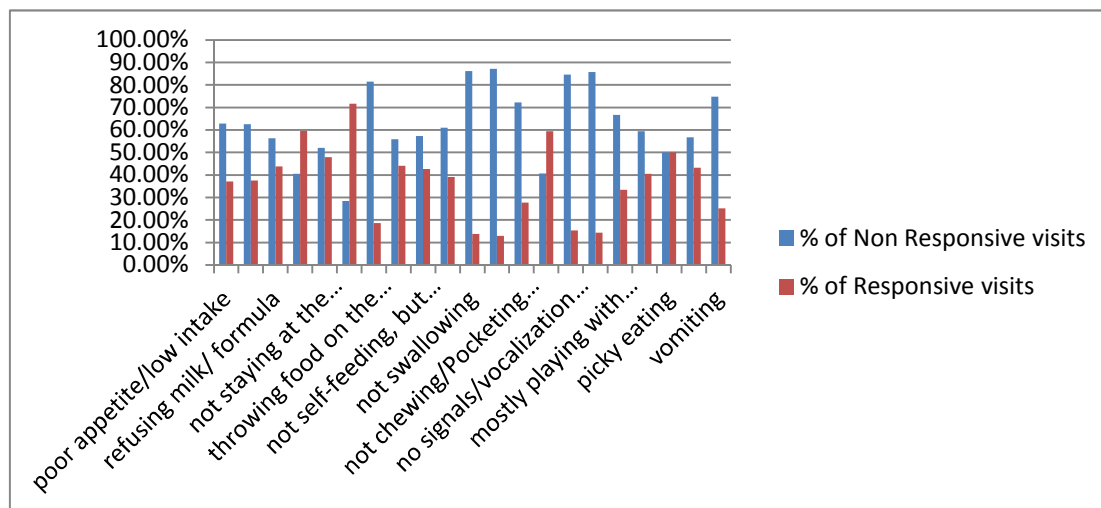


Figure 1: Number of visits for main child behaviours (responsive vs non-responsive groups)

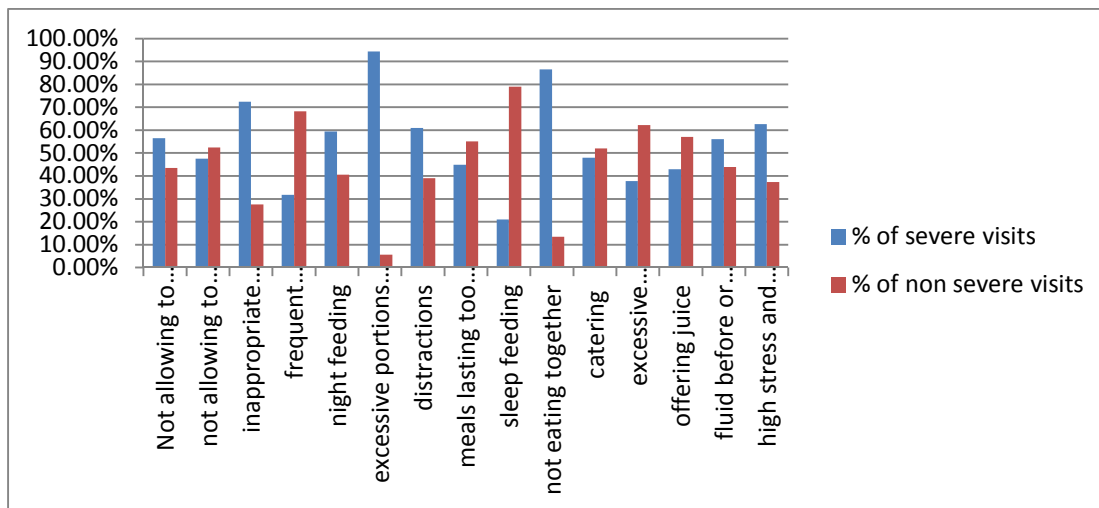


Figure 2: Number of visits for main parent behaviours (responsive vs non-responsive groups)

Table 8: Number of visits for each child behaviours & Percent of total visits for each behaviour

Child behaviours and # of Visits				
	<i>% visits of Non Responsive cases</i>	<i>% visits of Responsive cases</i>	<i>% of non Responsive visits as total non-responsive</i>	<i>% of Responsive visits as total responsive</i>
poor appetite/low intake	62.84	37.16	7.75	7.38
refusing solids	62.50	37.50	10.44	10.09
refusing milk/ formula	56.25	43.75	3.03	3.80
excess fluid	40.48	59.52	1.15	2.71
not staying at the table/high chair	52.05	47.95	5.12	7.59
spitting food	28.38	71.62	1.42	5.75
throwing food on the floor	81.40	18.60	2.36	0.87
screaming, crying, tantrums/Turning head away/not opening mouth	55.88	44.12	5.12	6.51
not self-feeding, but capable	57.32	42.68	6.33	7.59
rejecting age-appropriate textures	60.98	39.02	3.37	3.47
not swallowing	86.15	13.85	3.77	0.98
eating slowly	87.10	12.90	3.64	0.87
not chewing/Pocketing foods	72.22	27.78	3.50	2.17
no interest in food	40.63	59.38	1.75	4.12
no signals/vocalization of hunger	84.62	15.38	4.45	1.30
eating with distraction only	85.71	14.29	4.04	1.08
mostly playing with food instead of eating/not active during feeding	66.67	33.33	3.23	2.60
refusal to try new foods	59.46	40.54	2.96	3.25
picky eating	50.00	50.00	8.42	13.56
sensory issues	56.73	43.27	6.54	8.03
vomiting	74.78	25.22	11.59	6.29

Table 9: Number of visits for each parent behaviours & percent of total visits for each behaviour

Parent behaviours and # of visits				
	<i>% of non-responsive visits</i>	<i>% of responsive visits</i>	<i>% of non-responsive visits as total of non-responsive</i>	<i>% of responsive visits as total of responsive</i>
not allowing to self-feed	56.54	43.46	63.53	42.35
not allowing to explore/play with food	47.56	52.44	11.47	10.97
inappropriate texture for age	72.37	27.63	48.53	16.07
frequent snacking/meal offerings/on demand	31.78	68.22	10.00	18.62
night feeding	59.41	40.59	35.29	20.92
excessive portions offered	94.37	5.63	19.71	1.02
distractions	60.94	39.06	57.35	31.89
meals lasting too long	44.86	55.14	24.41	26.02
sleep feeding	21.05	78.95	1.18	3.83
not eating together	86.49	13.51	9.41	1.28
catering	48.04	51.96	28.82	27.04
excessive milk/formula/breastmilk/juice	37.79	62.21	38.24	54.59
offering juice	42.99	57.01	27.06	31.12
fluid before or with meals (juice/milk/water)	56.14	43.86	28.24	19.13
high stress and anxiety levels at meal time	62.70	37.30	23.24	11.99

Table 10: P values for total number of behaviours for parent and child

	Mean SD	Z score	P value
Child behaviours	0.736	1.228	0.11
Parent Behaviours	1.23	3.99	<0.001

According to these results, there were many distinct behaviours present, but no single behaviour can serve as a significant predictor of case severity. The sum of all behaviours, on the other hand, may serve as a better indicator of the severity level. As a result, all the behaviours as a group were analyzed to determine whether the values from responsive and non-responsive groups were related to one another. From the p value it was determined within 90% confidence that the two groups were not related, even though the samples were taken from the same population. This may prove that these behaviours, as a group were a viable indicator of responsiveness levels.

Chapter 5

DISCUSSION

The following chapter describes the implications of the results of this investigation, how they compare to previous findings in the literature, limitations of the study and how the results can be utilized in the future.

The main outcomes

The main statistically significant outcomes of this study showed that there was an association between the number of behaviours reported in a case and the patient's responsiveness to treatment: the greater the number of problematic behaviours present in a parent and child, the more likely they are to be less responsive to treatment. Another important result showed that the non-responsive patients had significantly more visits to the clinic than the patients in the responsive group.

Firstly these results show, that although the definition of a non-responsive or severe case is used only in the clinic where this study takes places and is based on clinical judgement and experience, these may have some value in screening and assessment. The two groups differed from one another in number of behavioural issues and the total number of interventions required along with other aspects which are discussed below. Secondly, these parameters may be utilized as the two primary dimensions to create a ranking scale in the future. A ranking tool based on these findings may assist in predicting the responsiveness or anticipated severity level of a patient case.

Another statistically and clinically significant outcome was the presence of an organic condition, which presented more frequently in the non-responsive cases than the responsive ones. This variable may also be utilized in the future design of the instrument as it may help predict severity of a case. Furthermore, the organic group had a significantly greater number of visits and a trend towards significantly higher number of presenting behaviours when compared to the non-organic group. The latter result is not something that has been reported in the literature and illustrates that children with behavioural and organic problems may require more time and interventions to manage their FD.

Main outcomes compared to previous research

Previous research has concentrated on analyzing differences between medically-based feeding issues and infant feeding disorders (IFD)/non-organic feeding disorders, despite the mounting evidence demonstrating a great overlap between organic conditions and feeding disorders and the ongoing professional discussions supporting this approach. There is evidence that behavioural feeding issues are often present in children with or without different types of organic conditions, from neurological to mechanical to gastrointestinal (Burklow et al, 1998). Furthermore, certain common symptoms like poor intake, poor weight gain and vomiting appear to not differ significantly between these two groups (Burklow et al, 1998; Levy et al, 2009). The data from this study did show that vomiting was more likely to occur in the group of children with medical conditions. This can be explained by the fact that the variety of medical conditions in this population was narrow and >60% of these patients had gastroesophageal reflux as the organic condition, of which vomiting is the main symptom. Otherwise, this study supports some of the other findings as results showed no significant difference in reporting of low oral intake between organic and non-organic groups and there was no difference between rates of weight gain or presence of underweight patients.

Instruments

The results obtained in this study can help create a tool that ranks patients based on their responsiveness or difficulty level rather than separating them into patients that have or do not have a medical condition, ignoring the typical overlap between organic and behavioural issues. The multifactorial approach that considers both organic and behavioural issues has not been incorporated to create a screening tool for the general paediatric population. For instance, the Wolfson criteria (Levine et al, 2011) is a screening tool with a similar purpose, but it is based on clinically significant characteristic differences between children with poor feeding due to a clearly defined organic condition and children who fit the Chatoor criteria (Chatoor, 2002) and were responsive to behavioural treatment only. Based on research results looking at these two groups, the Wolfson criteria uses food refusal, anticipatory gagging and pathological feeding (like force-feeding or use of distractions) as the key components of the screening tool, along with timing of onset and duration of problem (Levine et al, 2011). This screening tool therefore excludes cases with co-occurrence of medical conditions and behavioural feeding issues, which

may be common as evidenced by other research as well as clinical experience (Levy et al, 2009; Burklow et al, 1998.)

Another feeding scale was created using mother and infant behaviours, similarly to this study, but it was based on recordings of 20 feeding observations (Chatoor et al, 1997). This scale used mostly behavioural descriptions and its purpose was to differentiate between three types of feeding disorders, definitions of which have changed by this date. Most importantly, the usability of this scale is limited to observations of feeding sessions and it also does not address medical conditions.

Considering the limitations and the narrow scope of the instruments mentioned in this chapter and the literature review, it appeared reasonable to use the outcomes results of this study as a platform to creating a ranking tool in the future. The definition of non-responsive patient used here was: “no improvement after four appointments or more” and was used at the clinic where this study was undertaken. However, the definition of responsiveness may differ by clinical setting, but the tool can also be recalibrated using a different factor for severity. Using the number of presenting problematic behaviours and the number of visits to clinic to help determine the difficulty of the case may also be easy to carry out in most settings and for most people. Overall, there is a potential to design this tool based on the significant outcomes and tailor it to different clinical settings if needed.

Study limitations and considerations

One of the notable limitations of this study is the disproportionality between the responsive and non-responsive groups, as the more difficult cases represented only 25% of the study sample, resulting in less accurate statistical analyses. On one hand, the significant differences between group sizes made it difficult to analyze and obtain all the meaningful data that could have been obtained with a larger sample. On the other hand, because there were so many potential variables for comparisons, such as total visits for each behaviour, percent of each behaviour of total behaviours, percent behaviour of total severe or non-severe cases, comparing frequencies of behaviour, etc., they yielded more results supporting similar findings: more behaviours occurred

in the severe group and certain types of behaviours may occur more frequently in the severe group compared to the non-severe.

The strength of this data set is that all behaviours reported by parents and clinicians were recorded verbatim and therefore, to a certain extent, provide a bigger picture of what behaviours may be typically reported. Clinicians may have specific questions to ask, but parents also report whatever they feel is important. On the other hand, most behaviours are ambiguous and may be hard to interpret. This created difficulties when compiling behaviours and dividing them into child and parent categories. It is at times difficult to distinguish whether the child or the parent is in control of a specific behaviour or what is the reasoning for it. For example, the behaviour of not chewing or “pocketing foods” (holding in the mouth for long time periods) may have several causes like inappropriate motor skills, dislike of texture, trauma or even laziness to chew, depending on the child’s temperament and dietary milestones. This ambiguity along with typical reporting errors is a significant limitation, but also typical to qualitative data.

Implementing these behaviours in a future screening tool or ranking scale may be prolific. The total number of behaviours recorded for parents and children was substantial, which may appear cumbersome when using as part of a tool, but using a checklist may make this process fast and efficient. As an option, excluding certain behaviours that are rarely reported, such as sleep feeding, may be an option in the future and/or “other” category may be added.

Categorizing behaviours

The initial goal was to group behaviours under more general subcategories such as sensory issues, inadequate oral intake, inadequate feeding skills and others. This idea became impractical, because some of the child and parent behaviours within the same category were significantly associated with either the severe or non-severe group. For example, the subcategory of “low interest in food” included “eating with distractions only”, which was much more common in the non-responsive group and general “low interest in food”, which was significantly more common in the responsive group. Therefore, rather than using subcategories for behavioural groups, it was deemed best to use specific behaviours at this time. Assessment of the IFD type(s) present in a patient can still be easily done based on reported behaviours, because a clinician in this setting knows which behaviours correlate with which subtype of FD. Thus subcategories within the tool may be unnecessary while re-testing in this setting, but they may be

incorporated later on to make it more generalizable. In the meantime, incorporating specific behaviours into the screening tool and further research on its applicability/application may shine light on what questions to ask in order to clarify the cause or nature of the behaviours and thus reduce ambiguity, provide better terminology and help improve/enhance the tool.

Significance of anthropometric measures

No associations were found between low ideal body weight (IBW) or small for gestational age presentation and the responsiveness level of the patient. Weight or growth velocity does not appear to be a significant factor when predicting severity of the case. This falls in line with previous research outcomes that showed failure to thrive (FTT) to be present in children with or without organic or behavioural feeding issues (Levy et al, 2009) and the risk of under-diagnosing infant feeding disorders (IFD) when basing it on weight only. Again, one of the crucial factors underlying normal weight in cases of IFD is the ability to sustain growth via inappropriate nutrition and feeding strategies. It also has to be noted, that weight was usually compared between organic and non-organic groups, as opposed to severe and non-severe cases.

Furthermore, in the setting of this research most patients who fell in the low weight category were generally mildly underweight with a few cases of moderately underweight patients. Hence the differences in weights between the low body weight and normal body weight groups were not significant. If a similar study was conducted in a tertiary care setting, population demographics may differ and results may show otherwise. This has to be considered when designing and validating the screening tool, as it may have to be modified for different types of feeding clinics where the patient population may be more complex. Based on this data and other literature, excluding weight from the future screening tool as a measure is appropriate for the time being until further data is obtained.

Average monthly growth velocity, calculated from first to last appointment, also did not differ between the severe and non-severe group or organic versus non-organic groups. This reiterates the potentially limited value of using weight as a risk factor. It may also indicate that over time, the interventions provided at the clinic are effective in supporting adequate growth and preventing weight loss or faltering growth.

Parental Stress

According to the results of the present study, there was no significant relationship between parental stress and number of visits or number of behavioural feeding problems (BFPs) reported. The challenge with this analysis was that stress and parental anxiety were recorded as a separate symptom only at the interviewer's discretion. A very small group of parents, 13% of the sample size, had high stress and anxiety recorded in the chart, which may be far from the true prevalence. A better indicator may be certain problematic parental behaviours, which also happen to prevail in the non-responsive group. These include invasive behaviours such as excessive attention, not giving room to explore and frequent wiping of hands and face and they may be indicative of parental anxiety around feeding as they are unable to give the child space or independence at meal time and feel the need to control the situation. Due to the small number of cases with explicitly reported parental anxiety and more importantly, lack of a tool or consistent use of interview questions to inquire about parents' stress levels, these results do not provide valuable data. Ideally, one would develop a separate questionnaire to evaluate parental anxiety in paediatric cases since no such tool is in use at this time.

Summary

Some of the results provided by this study reflect and support previous findings (Sanders et al, 1993; Levy et al, 2009; Burklow et al, 1998; Parkinson et al, 2004), such as similar problematic behaviours exhibited, like the ones outlined in Table 1, the importance of integrating both medical and behavioural conditions during clinical evaluation (for example, when both reflux and sensory aversion are present) and limitations of using anthropometric measures in predicting the presence of a medical condition or severity of the feeding problem.

Overall, this chart review provided a detailed picture presented by patients with FDs and their families in a clinical setting. These data will add to the body of literature and may aid in the development of specific terminology and acceptance of one of the currently used categorization scales, since over the past years the proposed scales have been similar.

This study also generated the idea of defining a difficult or non-responsive case and comparing it to the responsive cases. This categorization appears much more appropriate as it can still capture all possible underlying causes of feeding difficulties and allow comparison of the two groups. It also provides room for ample future exploration with regards to what constitutes a difficult case,

what aspects should be compared between the two groups and how this can be utilized to build a ranking scale or a screening tool.

Lastly, through the literature review and data collection, it was observed that at the core of most FDs there were several main issues such as nutrition, behaviours around feeding and in some cases medical history. The corresponding interventions (not reported in this study) were always provided by the Dietitian and the Paediatrician, often times together. Working in such a collaborative and dynamic environment yielded effective results - according to the clinic's definition, 75% of the patients were responsive to treatment and all patients had the same weight gain velocity. This is also a great representation of the Registered Dietitian's role, as no other health care provider can offer detailed and comprehensive counselling that involves dietary recommendations and guidance to creating an appropriate meal environment, education on feeding techniques and understanding the child's cues and behaviours with regards to food, and teaching all this while creating a personalized plan for each patient and family. It is important to note that no other clinician within the multidisciplinary team is trained to fulfill these roles - all these responsibilities are within the RD's scope of practice if they choose to specialize in infant feeding.

Hopefully, this report has supplied its readers with knowledge and appreciation for the paediatric population with feeding difficulties in primary care setting, as well as an understanding of the importance of consistent terminology and a widely accepted categorization system in the treatment of this group. The aim of this study was also to elucidate the importance of creating a ranking or screening tool that captures all aspects of the feeding issues and facilitates clinicians' management of this population. The results of this study will be used as a stepping stone for the development and validation of a ranking scale. Lastly, it is important to remember that optimal results are achieved when interdisciplinary teams are involved in management of feeding difficulties. Registered Dietitians play a particularly central role in the realm of feeding as they are best equipped to address all the core issues.

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Appendix A: Ethics Approval



Research Ethics

Use of Human Participants - Ethics Approval Notice

Principal Investigator: Dr. Alicia Garcia

File Number: 102575

Review Level: Delegated

Approved Local Adult Participants: 0

Approved Local Minor Participants: 0

Protocol Title: Behavioural feeding problems in normally-developing children under 4 years of age: development and usability of a ranking tool

Department & Institution: Brescia Nutrition and Food Sciences, Brescia University College

Sponsor:

Ethics Approval Date: April 11, 2013 Expiry Date: April 30, 2014

Documents Reviewed & Approved & Documents Received for Information:

Document Name	Comments	Version Date
Western University Protocol		
Letter of Information & Consent		
Other	Consent Form	
Other	Approval Letter	
Other	Chart Abstraction Sheet – Initial Assessment	
Other	PROTOTYPE OF A RANKING SCALE	
Instruments	Appendix H: Telephone Script for Information Clarification	2013/03/06
Revised Letter of Information & Consent	Appendix G: Consent Form for the Participant	2013/03/06
Revised Letter of Information & Consent	Appendix F: Letter of Information for Participant	2013/03/06
Instruments	Appendix D: Chart Abstraction Sheets	2013/03/06
Instruments	Appendix E: Prototype of a Ranking Scale	2013/03/06
Approval Notice	Appendix C: Letter of Approval from Collaborator	2013/03/06
Revised Letter of Information & Consent	Appendix A: Letter of Information for Collaborator	2013/03/06
Revised Letter of Information & Consent	Appendix B: Consent Form for Collaborator	2013/03/06

This is to notify you that The University of Western Ontario Research Ethics Board for Health Sciences Research Involving Human Subjects (HSREB) which is organized and operates according to the Tri-Council Policy Statement: Ethical Conduct of Research Involving Humans and the Health Canada/ICH Good Clinical Practice Practices: Consolidated Guidelines; and the applicable laws and regulations of Ontario has reviewed and granted approval to the above referenced revision(s) or amendment(s) on the approval date noted above. The membership of this REB also complies with the membership requirements for REB's as defined in Division 5 of the Food and Drug Regulations.

The ethics approval for this study shall remain valid until the expiry date noted above assuming timely and acceptable responses to the HSREB's periodic requests for surveillance and monitoring information. If you require an updated approval notice prior to that time you must request it using the University of Western Ontario Updated Approval Request Form.

Members of the HSREB who are named as investigators in research studies, or declare a conflict of interest, do not participate in discussion related to, nor vote on, such studies when they are presented to the HSREB.

The Chair of the HSREB is Dr. Joseph Gilbert. The HSREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000940.

LETTER OF INFORMATION FOR COLLABORATOR

Title of the Study:

Behavioural feeding problems in normally-developing children under 4 years of age: development and usability of a ranking tool

Study Investigators and Collaborators:

Dr. Alicia C. Garcia, PhD, RD, CFE; Professor and Chair, Division of Food and Nutritional Sciences

Dr. Colleen Gobert, PhD, RD; Assistant Professor

Dr. Glenn Berall, MD, FRCPC; Chief of Paediatrics and Medical Director, Child and Teen program; North York General Hospital

Graduate Student Investigator:

Julia Stanislavskaya, Registered Dietitian

Purpose of the letter

The purpose of this letter is to inform you of the nature of the study we wish to conduct at this clinic. The goal is to receive your support as the study collaborator and access to the available data.

Study Overview

This study looks at different types of behavioural feeding difficulties and their severity in children 6 – 48 months of age. There is limited research on treatment methods and outcomes in children with behavioural feeding difficulties. This study will examine the current management of children with these issues and will use the obtained information to develop and test the usability of a new tool to help us provide more effective feeding recommendations for children with behavioural feeding problems.

Specifically, we are looking for children between six and 48 months of age, referred for any type of feeding difficulty, weight loss or for a medical condition in combination with feeding issues. Information will not be collected if children are older than 48 months of age, have genetic

disorders, physical and/or mental developmental delays, colic or are tube fed at the time of referral.

Benefits from the Study:

Review of the clinic's medical charts will add to the scarce body of literature and will provide a better understanding of this population, treatment methods and subsequent clinical outcomes. Application of the new assessment tool, which includes a ranking scale, may help ease the confusion associated with complex behavioural feeding disorders and may help clinicians determine the severity of the case, thus leading to a more effective treatment plan.

Risks to Participation in the Study

There are no risks to patients participating in this study. Aside from using a new form to collect data on initial assessment, there will be no other changes in the care provided.

Confidentiality

There will be no data with identifying information in this study. The research records will be stored in a password-protected computer, which is locked in a secure office at North York General Hospital. The Research Ethics Board of the University of Western Ontario may require access to your records for the purpose of monitoring the conduct of the research. The data for the study will be kept for a period of 5 years following publication of the research, after which it will be shredded.

Questions and Contact Information

Julia Stanislavskaia, tel: xxx-xxx-xxxx

Dr. Alicia C. Garcia, tel: (xxx) xxx-xxxx, ext: xxxxxx

I have read and understood the Letter of Information,

Print Name

Signature

Date

Appendix C

CONSENT FORM

Title of the Study:

Behavioural feeding problems in normally-developing children under 4 years of age:

I have read the Letter of Information and fully understand the purpose and methods of the proposed study. I agree to participate and allow for this research to take place at North York General Hospital, Ambulatory Paediatric Clinic.

Print Name

Signature of Authorized Representative

Date

Printed Name of Person Obtaining Consent

Signature of Person Obtaining Consent

Date

Appendix D

Chart Abstraction Sheet –Initial Assessment

INFO	DATA COLLECTED
Patient code	
Gender	
Age (months, calculated from DOB)	
Reason for Referral	
Weight	
Length	
%Ideal Body Weight	
Medical History	
Medications and Supplements	
Dietary history	
Parental Feeding behaviours	
Child Feeding Behaviours	
Diagnosis	
Interventions	

Appendix E

Data Abstraction Sheet- Follow up appointments

Data	Follow up 1	Follow up 2	Follow up 3	Follow up 4	Follow up 5
Patient code					
Time lag in weeks					
Weight					
Length					
% Ideal Body Weight					
Medical history					
Medications and Supplements					
Dietary Intake changes (Solid)					
Dietary Intake changes (Fluid)					
Child feeding behaviours					
Parent feeding behaviours					
Assessment (change in behaviours, change in weight)					
Intervention s					

Appendix F

Initial Assessment Form



PEDIATRIC NUTRITION CLINIC – INITIAL ASSESSMENT -

Name: _____ Date(dd/mm/yyyy): _____
 Reason for referral: _____ Referred by: _____
 Family/Social History: Lives with: ☐mother ☐father ☐siblings ☐Other _____
 Wt: _____ kg (_____%ile) Ht: _____ cm (_____%ile) BMI: _____ IBW: _____ kg %IBW: _____ BP: _____
 Wt history: _____

MEDICAL HISTORY (check all applicable)

<input type="checkbox"/> Asthma	<input type="checkbox"/> Diarrhea	<input type="checkbox"/> G.E Reflux	<input type="checkbox"/> Genetic/Congenital Problem
<input type="checkbox"/> Hyper/hypothyroidism	<input type="checkbox"/> Constipation	<input type="checkbox"/> Vomiting	<input type="checkbox"/> Developmental Delay
<input type="checkbox"/> Hypertension	<input type="checkbox"/> Food allergies/intolerance	<input type="checkbox"/> Aspiration	<input type="checkbox"/> Cerebral Palsy
<input type="checkbox"/> Hyperlipidemia	<input type="checkbox"/> Dysphagia	<input type="checkbox"/> Pneumonia	

Family Medical History: _____

CURRENT HISTORY: _____

Medications: _____

Herbs/Vitamins/Minerals: _____

Other (teasing, financial, marital, conflict with caregivers, school problems) _____

NUTRITION HISTORY (including factors affecting intake: emotions, peer pressure, likes/dislikes, body image)

DIETARY RECALL

Breakfast	AM	Lunch	PM	Dinner	HS

Activity: _____

TV _____; Computer _____; Other: _____

Clinical Findings: _____

ASSESSMENT:

☐ Severely underwt (<60% IBW) ☐ Moderately underwt (60-80%IBW) ☐ Mildly underwt (80-90%IBW)

☐ Appropriate wt for ht (90-110%IBW) ☐ Overwt (110-120%IBW) ☐ Obese (>120%IBW)

Diagnosis: _____

Goal: ☐ normal wt gain ☐ faster wt gain ☐ slower wt gain ☐ wt loss ☐ weight stability ☐ _____

PLAN:

☐ Food Records ☐ Food Frequency ☐ Healthy Eating Class ☐ Toddler Feeding Class

RESOURCES GIVEN

☐ Healthy Snacking ☐ Sometimes foods _____

REFERRALS

☐ Sports Medicine ☐ Gastroenterologist ☐ Allergy/Asthma Specialist ☐ Child Life Specialist ☐ Social Work

RTC: _____

Appendix G

Follow Up Assessment Form

PEDIATRIC NUTRITION CLINIC - FOLLOW-UP -

Name: _____ Date(dd/mm/yyyy): _____

Wt: _____ kg, Ht: _____ cm, Previous Wt: _____ kg, Wt Δ \uparrow \downarrow - _____ kg; Ht: _____ cm, Ht Δ \uparrow \downarrow - _____ cm, BP: _____

Current history: _____

DIETARY RECALL

Breakfast	AM	Lunch	PM	Dinner	HS

Activity: _____

Medications: _____

Clinical Findings: _____

ASSESSMENT Wt ☐ Gaining ☐ Losing ☐ Maintaining FOLLOWING RECOMMENDATIONS ☐ Yes ☐ No MOVING TOWARDS GOAL: ☐ Yes ☐ No

PLAN/ GOALS (Family &/or child): _____

RESOURCES: ☐ CFGHE ☐ Junk Food ☐ BFD ☐ Indiv. Contract ☐ RYG Calorie Level ☐ Fitness Log ☐ Snacking ☐ Other: _____

RTC: _____

Registered Dietitian

Dr. G. Berall

Curriculum Vitae

Name: Julia Stanislavskaia

Education: Ryerson University,
Toronto, Ontario, Canada
BASc in Food and Nutrition (with honours)
2003- 2007, BASc

North York General Hospital
Toronto, Ontario, Canada
2008, RD

Related Work
Experience: Research Assistant
Ryerson University
2006-2007

Registered Dietitian
North York General Hospital
2008-2012

Registered Dietitian
Seasons Care
2008-2009

Registered Dietitian
Stonegate Community Health Centre
2008-2012

Teaching Assistant
University of Western Ontario
2011

Registered Dietitian
Taddle Creek Family Health Team
2009- Present